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CHEMICAL AGE

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RUMANIA TODAY

RUMANIA, which only a few years ago, was a heavy importer of chemicals, now exports 83 chemical products to 30 countries, states a report issued from Bucharest. Chemical production is claimed to have risen eightfold since 1938, and according to the report there is every sign that it will go on growing at the same rate.

Today, a variety of national resources, which were not previously utilised, such as mineral oil, methane gas, coal, salt, wood and pyrites, are now being drawn on. Particularly large are the methane gas reserves—occurring in the Transylvanian tableland as a natural product of high purity (over 99.5 per cent)—which are used mainly for the production of ammonia for the artificial fertiliser industry, for the production of acetylene for the pharmaceutical, paint and lacquer industries and for producing carbon black. Rumania is, in fact, a large-scale fertiliser producer and one of the world's largest carbon black manufacturers and exporters. Granulated carbon, production of which will have doubled by 1960, is exported to rubber producers all over Europe and to India and elsewhere.

Production of fertilisers is said to be increasing at a rapid rate. The Government estimates a production total for 1958 of 170,000 metric tons. A number of large new production units will, it is estimated, boost the 1960 total to 500,000 metric tons, while for 1965 a total of 1¼ million metric tons is suggested and for 1970, 3 million metric tons.

Of a number of major plants now nearing completion or on the point of going into production, is a sulphuric acid and superphosphate plant at Navodari in the Dobrudgea. This will be one of the country's most important chemical enterprises. Granulated superphosphates will feature largely in the yearly output of chemical fertilisers and in 1960 are expected to represent one-third of total deliveries to Rumanian agriculture. The kilns for the roasting of pyrites at the Navodari plant are designed to make use of indigenous pyrites which has a low sulphur content.

At Savineshti, in Moldavia, a new synthetic fibres factory is almost ready to begin production. Its capacity will be 2,000 tons of Relon a year. Two grades of this artificial fibre will be produced, one suitable for industrial purposes, such as ropes, nets, etc., and the other for the manufacture of hosiery, lingerie and various fabrics.

In the same area at Borzeshti, a chemical combine is being built. A new plant there is to produce 30,000 metric tons of chlorine and caustic soda by electrolysis (from salt extracted from local brine pits), 25.000-50.000 metric tons of synthetic rubber from 'cracking-gases' from a nearby refinery and 15.000 metric tons of vinyl chloride, and fatty acids.

This year, what is described as one of the most modern reed-pulp processing plants in the world was set up with Czech, East German and Polish assistance, at Braila, on the lower Danube. The plant will process river delta reeds which cover an area of 650.000 acres. Their yield is 2.5 million tons a year. This chemical concern will consist of a cellulose plant with an initial annual capacity of 50,000 metric tons and an ultimate annual capacity of 100.000 metric tons, a furfurol plant and a plant to produce pressed boards and cardboard.

It is of interest to note that these construction and development schemes

are being carried out in regions of Rumania which before the war were the most neglected and backward. In 1938, a bare 5 per cent of Rumanian industrial output could be attributed to production centres in Moldavia and the Dobrudgea.

In the petrochemical field, projects now being considered include the setting up of a plant to produce ethyl alcohol by pyrolysis of casing head gases after the removal of butane. Another project provides for the construction of a plant for the purification of ethylene and the manufacture and processing of polythene. Ethylene will also be the raw material basis for the production of ethyl alcohol, ethylene oxide, glycol, ethanolamine, etc.

Primary benzenes extracted from crude oils occurring in Muntenia are being used for the extraction of monocyclic aromatic fractions such as benzene, toluene and xylene. Extraction of these hydrocarbons from benzenes will be by catalytic reforming, plant for which will be set up 'no later than the end of the Five-Year Plan'. It is planned to use benzene in the manufacture of styrene and cumene. A semi-industrial plant for alkylating and catalytic dehydrogenation will be put into operation at the end of this year. Styrene will be copolymerised with butadiene for the production of type 'S' rubber, and for production of polystyrene. Cumene will be used as an intermediate in the manufacture of phenol required in the production of plastics and fibres.

Special importance is being given to the production of phthalic plasticisers; a semi-industrial plant is being put into operation where the xylene extracted from benzene will be purified and oxidised.

Rumanian benzene is reported as containing a high proportion of naphthenes; because of this the separation of cyclohexane and the isomerisation of methylcyclopentane will be effected on an industrial scale with a view to the production of raw and auxiliary materials required in the manufacture of plastics materials and polyamides; a semi-industrial plant is already in the process of construction.

Olefins and aromatic hydrocarbons from petroleum cracking are to be used in the manufacture of soap substitutes. An original process of alkylation and sulphonation will be used in the production of alkyl-aryl-sulphonic detergents in an industrial unit which is due to be commissioned this year.

Another project provides for the construction of an industrial plant for the processing of higher alcohols, via oxosynthesis of olefins. Fatty acids for soaps, paints and plasticisers are to be produced from paraffin, obtained as a by-product in the manufacture of lubricants. A new process has been developed, which is stated to give satisfactory conversion into fatty acids and alcohols. A new process is also being used to extract naphthenic acids from the lyes resulting from the refining of kerosene and gas oil.

UREA-FORMALDEHYDE

COMBINATIONS of urea and formaldehyde are well known as fertilisers—for a number of years development work has been in progress and condensation products of mixed urea and formaldehyde are now used increasingly as slow-acting nitrogenous fertilisers, although more particularly for lawn turf and market garden crops than for farm crops. The function of the formaldehyde is not, of course, plant-nutritional—it is the chemical 'agent' which enables the nitrogen in urea to be slowly instead of speedily released.

Quite recently (J. F. Bartz and K. C. Berger, *Journal of Agricultural and Food Chem.*, 1958, **6**, 675) a new agricultural use for urea-formaldehyde mixtures was reported in America—as a soil fungicide for controlling scab disease of potatoes. Here it is the formaldehyde that exerts the primary function and it is the urea which is the 'agent' making the formaldehyde less volatile and therefore more persistent in the soil. Chemically, this is a most interesting reversal of the roles in this much studied partnership. It is perhaps a more promising development than the fertiliser aim for, whereas in urea-formaldehyde fertilisers the formaldehyde is virtually a diluent, in a urea-formaldehyde fungicide, the urea can still exert its full function as a source of nitrogen.

Tests during 1956 and 1957 are described in the paper, and in both years the incidence of potato scab was substantially reduced, by about 94 per cent in 1956 and by about 93 per cent in 1957. The second year's results are all the more impressive as it was a season in which weather favoured a much higher incidence of scab attack.

The idea that urea-formaldehyde combinations are of the same kind for fertiliser or fungicidal use must not be suggested, however. The fertiliser products have urea: formaldehyde ratios of more than 1, and they are solids with high polymerisation. The new urea : formaldehyde fungicide is a liquid composed of approximately 26 per cent urea and 60 per cent formaldehyde, with a molecular ratio of U/F 0.217. It is a polymethylol urea rather than a condensed 'urea-form.' It is applied as a liquid diluted with water at the site; the maximum rate is 150 gallons per acre. Nevertheless the 26 per cent of urea contained in the product is effective as a nitrogen fertiliser. The anti-scab treatment provides rather more than 3 cwt. of urea per acre, which is equialent in nitrogen supply to more than 6 cwt. of sulphate of ammonia, a fairly high rate of nitrogen supply for the potato crop.

US EXPANSIONS IN POLYMERS

RECENT reports have revealed a renewal of activity in polyolefins. At the end of last month, British Celanese stated that ethylene-propylene capacity at their Spondon, Derby, plant was to be expanded by approximately 40 per cent of present capacity (CHEMICAL AGE, 25 October, p. 682).

In Italy, Montecatini are to increase production of polypropylene to 20,000 tons a year, and the expansion will be designed to permit output to be raised to 30,000 tons (CHEMICAL AGE, 8 November, p. 765).

Another expansion of major proportions in the polyolefin field to be completed by the middle of next year was announced by Dow Chemical in the US. This company has already completed its polythene expansion programme whereby capacity for this polyolefin has been doubled from the original 25 million lb. capacity. The new expansion planned is understood to be in conventional as against low-pressure process polythene. Dow are, of course, now setting up a low-pressure polythene plant.

Warnings of over-capacity in plastics in the US are now being heard, particularly as plastics sales to date have not shown an increase on those in 1957. A spokesman for Union Carbide Plastics, US (*Chem. and Engng. News*, 1958, **38**, No. 44, 31) recently pinpointed present US over-capacity and quoted the following: polythene—1958 sales have reached more than one billion lb., but capacity is 1.3 billion lb.; vinyl—sales this year total 730 million lb., but capacity is over 930 million lb.; phenolics—sales total 425 million lb., but capacity is about 700 million lb.; epoxy resins—sales have reached 35 million lb., but capacity is 75 million lb.

More growth in the plastics field is anticipated in the US. At the same time overseas countries which have been taking US plastics, are now developing their own plastics. So unless the US can open up new markets and new outlets for plastics (such as the use of polythene for hula hoops, now at the $30 million level), over-capacity is likely to continue for some time.

Dr. Cook, Exeter Vice-chancellor, is First Polymer Enquiry Witness

Disagrees with BoT Definition of 'Synthetic Organic Chemical'

ARBITRATION which began on 3 November (see 'Chemical Age', 8 November, p. 752) regarding complaints that certain polymers were improperly excluded from the Key Industry List J, was continued until 5 November and resumed on 10 November. The case is being heard before a referee, Mr. A. W. Roskill, QC, Professor E. D. Hughes, Professor of Chemistry, University College, London, and Professor E. E. Turner, Professor of Chemistry, Bedford College, London.

Appearing for the complainants Bakelite Ltd., Distillers Co. Ltd., Imperial Chemical Industries Ltd. and Monsanto Chemicals Ltd. was Sir Lionel Heald, QC, with Mr. S. Gratwick. Mr. Kenneth Johnston, QC, and Mr. Rodger Winn appeared on behalf of the Board of Trade, and Mr. J. P. Graham, QC, with Mr. G. D. Everington, appeared on behalf of the opponents, Anglo-American Plastics Ltd., British Cellophane Ltd., Chiltern Hunt Ltd., Henry Jackson (Liverpool) Ltd., Metal Box Co. Ltd., and Armoride Ltd., Commercial Plastics Ltd., Duraplex Plastics Ltd., Rubber Improvements, Stanley Smith and Co., Storeys, and Wallington Weston.

Sir Lionel Heald described the plastics industry as a 'distinguished scion of the chemical industry, which had now grown up and set up house on its own'. Polymers were being imported in large quantities and competed with UK products.

For the complainants, Sir Lionel said that the polymers imported should be chargeable under part 1 of the Safeguarding of Industries Act, because they were synthetic organic chemicals within the ordinary meaning of these words. The opponents, however, say that while the polymers in question (polythene, polymethyl methacrylate, polystyrene and polyvinyl chloride (p.v.c.) comply with the words 'synthetic' and 'organic', they are not chemicals within the meaning of the Schedule, because they say the word 'chemical' must be given a very special and very limited meaning.

Polymer Still a Chemical

To illustrate the point about chemicals, Sir Lionel referred to polystyrene. Styrene, which was already on the KID list, was being imported under the official designation of a chemical in the Treasury Import List of 1958. Styrene itself was a KID chemical and to produce the polymer polystyrene from the monomer, styrene, was beyond question a chemical process to which nothing was added or subtracted except that heating took place at a certain pressure. What was admittedly a synthetic organic chemical within the Act had been subjected to a chemical process. It was therefore difficult to see how the product ceased to be a chemical.

Sir Lionel suggested that the polymers in question satisfied even the narrowest definition that could reasonably be given to the expression 'synthetic organic chemicals' on the most technical view.

He submitted that the definition actually suggested by the opponents and the BoT was not only unjustifiable and wrong technically, but it would also defeat the purposes of the Act itself and was in any event excluded by the construction of the Act itself, having regard to numerous materials (polymers) already included in the Schedule.

At a late stage in the present matter the opponents stated they wished to introduce a ground of objection, namely, that the last paragraph of the Schedule to the Safeguarding of Industries Act, 1921, was limited to fine chemicals and chemicals manufactured by fermentation processes only. This particular statement, last put forward in 1928, was rejected by the referee at that time.

Some attention was given by Sir Lionel to the description of a fine chemical. He said that at the time when the Safeguarding of Industries Act was passed, people talked about fine chemicals and heavy chemicals but no one had attempted to draw a line between them.

The first document to be presented was the Treasury Import List, 1958. On p. 37 under Division 1, Chemicals; subheading 'Plastics Materials', were acrylics, etc.; p.v.c., and other plastics materials:—thermoplastics (including polythene, polytetrafluoroethylene, polystyrene and polyvinyl acetate).

Monthly Digest References

In the Monthly Digest of Statistics under the general heading 'Chemicals' net sales of plastics materials were given, the source of the figures being HM Customs and Excise and the BoT.

The Treasury's *Bulletin for Industry*, on page 3 discussed increased production of the chemical industry, noting that the industry was one where new plastics and new drugs, etc., had carved out new markets at home and abroad.

Later in the proceedings, Sir Lionel dealt with the position of cellulose acetate and paraformaldehyde with regard to the Customs Act. These two materials were dutiable under the Safeguarding of Industries Act. If no polymers could come within the Act, then having regard to the Board of Trade argument, for 30 or 40 years the Board had been extracting duty from people under this Act, on a basis which they now say is fundamentally illegal.

Reference was also made to melamine-formaldehyde and certain points made by the opponents in presenting their case, namely, paragraphs 7 and 8:

> (7) 'The disputed materials are not designated chemicals in all industries directly concerned with them, and in particular are not so designated in those industries making products from the materials as manufactured.'

And:—

> (8) 'The term chemical is not properly applied in any context to materials which however manufactured are normally used and/or intended to be used on account of their mechanical properties for constructional purposes. The disputed materials are normally so used and intended to be used.'

Melamine-formaldehyde, Sir Lionel pointed out was in fact used as an adhesive. The fact that polymers were already in the KID list in the Act was something which made the argument really ridiculous in some respects.

Generic Judgment

Asked by the referee concerning a paragraph in the BoT's case indicating that 'all polymers are excluded', Sir Lionel referred to paragraph 4 and the words 'which has a definite molecular composition and consists of a single molecular species' the said articles are mixtures whose innumerable components were not definable and had never had separate existence. This was 'a generic judgment in relation to polymers as a whole'. It was not understood 'that there was anything in the language which could be applicable to polystyrene which was not applicable to paraformaldehyde or cellulose acetate or any of these other ones.'

In the past the BoT had obviously interpreted the Act in a broader sense because, for many years, at least nine different types of polymers had been included in the KID list. It was impossible to understand how on the ground of legal principle, polyoxymethylene (one of the nine) consisting of polymers of formaldehyde of varying molecular weight could be included, while p.v.c. and the other polymers were excluded.

The first witness called was Dr. J. W. Cook, Vice-Chancellor of the University of Exeter. Sir Lionel asked Dr. Cook to define the words synthetic and organic. He also asked Dr. Cook whether the four plastics concerned in the proceedings were articles to which the words 'organic' and 'synthetic' were applicable in the realm of chemistry, to which Dr. Cook replied 'Yes'.

The witness was then asked by Sir Lionel to read paragraph 4 of the preliminary statement by the BoT, namely

> '. . . The Board considers . . . a synthetic organic chemical to be an organic compound or substance, produced by syntheses, which has a definite molecular composition and consists of a single molecular species'.

'Why Should Styrene be KID Listed but not the Polymers?'—Dr. Cook

Dr. Cook said that he had read this statement with surprise, he had no knowledge of any publication in which such a definition appeared and it was new to read such a restrictive definition of the term used.

Of the reference in the BoT statement in paragraph 4:

> 'The said articles are mixtures whose innumerable components are not chemically definable and have never had a separate existence'.

Dr. Cook said that it was certainly true that each of these four polymers was a mixture of a number of components not of innumerable components. He would not subscribe to the statement that they were not chemically definable. They were chemically definable by the ordinary physical and chemical tests which could be applied to chemical substances. Asked whether he had read the statement submitted by the claimants and whether there was anything in it with which he would not wish to be associated, Dr. Cook said he wholly subscribed to everything that was said in it.

Paragraph 5 of the opponents' statement was read to Dr. Cook:

> 'None of the disputed materials has a definitely ascertainable structure nor a formula which can be precisely specified and each of them consists of a mixture of substances which have never had any independent existence and whose structure and formula cannot be definitely ascertained or postulated with accuracy'.

'Only Partly True'

Dr. Cook said he would regard this statement as being only partly true for while it was true that none of the disputed materials had a definitely ascertainable structure in the sense that each consisted of a mixture of substances which had never had an independent existence, the general structure of the molecules and components which made up polymers could certainly be defined with a very high degree of accuracy.

Paragraph 8 (see above) was also read to Dr. Cook, who in his reply stated that this was a new point of view to him. He had never before heard it suggested that a chemical or chemical substance or chemical compound was any less one of those because it was used in a specific way. Different polymers had different qualities: polythene, for example, was used extensively on account of its electrical insulating properties; polymethyl methacrylate, because of its transparency. Replying to a question by Sir Lionel as to whether those qualities were derived from their chemical properties, Dr. Cook said they were mostly qualities which were derived from their character as macromolecular substances, in other words as polymers.

On being asked whether he could help the tribunal with regard to identification or analysis of these substances, Dr. Cook stated that polymers could be identified by various methods of analysis and by examination of physical constants. Infrared absorption was particularly significant. He considered that the nine compounds listed as polymers in the KID list were polymers.

Sir Lionel asked Dr. Cook to explain the relationship between the polymers and the corresponding monomers which were already on the KID list in the case of vinyl chloride, methyl methacrylate and styrene. Dr. Cook said he was puzzled as to why p.v.c. and styrene should be placed on the KID list and yet the polymers were excluded. 'If that situation persists surely all the manufacturer has to do if he wants to import these materials into this country is instead of sending the monomers which would be subject to duty, to polymerise them and send the polymers, which would be free of duty'. It was a very simple chemical operation to convert the monomers into polymers.

Large Range of Mol. Wt.

Mr. Johnston, cross-examining Dr. Cook, asked if it was right that if any one of the polymers, or a specimen of any one of them was taken, it would include a very large range of molecular weights? Dr. Cook agreed that there would be a considerable range of molecular weights. Asked if it would vary from one sample to another, according to how they were made, Dr. Cook said it might do so, in a controllable fashion.

Mr. Johnston then inquired about those various molecules of differing size, differing in structure; i.e., they might be branched or long straight chains of the initial monomer, or they might have branches, etc. Dr. Cook said it was certainly true that branched chain structures could arise in certain of the cases under certain conditions, but these would be exceptions.

Mr. Johnston then questioned Dr. Cook about the effect of structure of the molecule on the type of polymer evolved.

Two examples of polystyrene, one with a molecular weight of 200 to 400 (a liquid) and the other having a molecular weight of almost 150,000 (polystyrene KLP, SPT90°C) were handed to Dr. Cook for examination. Mr. Johnston then suggested that these terms polystyrene, polyethylene, so far from being substances, were a whole range of substances, to which Dr. Cook agreed. The method used for making them would determine the kind of properties wanted.

Mr. Johnston asked whether any particular specimen of one of the polymers in question was a chemical compound. Dr. Cook said he would not go so far as to say it was a single chemical compound. An ordinary polymer would have its components so closely related to one another in their properties that they would be indistinguishable by their general properties and by the normal chemical and physical tests one applied.

Cross-examination of Dr. Cook by Mr. Johnston was continued on 4 November. Asked to look at the definition of 'synthetics', and 'synthesis' taken from the Shorter Oxford Dictionary, Dr. Cook said that the definition of synthesis was too restricted.

Asked whether he would accept formation of a compound by combination of its elements or its constituents, Dr. Cook said he would. Mr. Johnston suggested that Dr. Cook would not be able to say that any one of these polymers should fall that part, to which the witness said he would not call a polymer a compound in a strict chemical sense. In reply to the question 'What do you mean by a chemical substance,' Dr. Cook said the natural polymer cellulose was commonly regarded by chemists as a substance; so was the other carbohydrate material, dextran. These were all chemical substances, and they would not be, in modern terms, defined as chemical compounds in the absolutely rigid sense of the term.

Mr. Johnston later introduced a definition from Hackh's Chemical Dictionary, which dealt with the word 'chemical' —a compound or a substance of a definite molecular composition. He asked Dr. Cook to say that polymers were not that, to which Dr. Cook replied that it all depended on how you defined composition.

Again Mr. Johnston posed this question and Dr. Cook said polymers were not of definite molecular structure, if that was what composition meant, but composition could be used in a variety of senses. In a chemical sense it usually meant a proportion of elements present, and these compounds were compounds of definite composition in that sense.

'Chain of Monomers'

Instancing polythene as an example, Mr. Jonnstone asked whether it was always made up of a particular monomer to which Dr. Cook said yes, there was a chain of monomers. Replying to further questions about polythene, Dr. Cook said that in the case of polythene, there might be branches and that these might be crosslinked and that they might have the same repeating unit, repeated over and over again. In that sense they were single molecular species. They had the same composition, and the same molecular grouping which could be detected chemically.

Mr. Johnston referred to evidence by Dr. Cook on the previous day about imports of polymer and depolymerisation of polymer, and asked him if he knew anything about the mechanics of depolymerising. He was not able to say, for example, that someone who bought the polymer or made it, then transported it, depolymerised it and purified the result to get the monomer was going to find it any cheaper than buying a monomer abroad and paying the duty. Dr. Cook denied this.

In the cross-examination by Mr. Graham, Dr. Cook was taken through various sections of the Safeguarding of Industries Act and asked about various instruments listed, 'all synthetic organic chemicals (other than synthetic organic dyestuffs)', analytical reagents, and chemicals manufactured by fermentation. In answering about this last section, Dr. Cook said antibiotics were manufactured

by fermentation processes, but having regard to the time the schedule was drawn up, he imagined it would relate to solvents like acetone, butyl alcohol, etc. Replying to Mr. Johnston on whether they could now also be made by synthetic processes, Dr. Cook said fermentation was more or less an alternative method in most cases, and slightly cheaper. To the inquiry as to whether the process was really a biochemical process, the witness said it was a 'biochemical process or something of a microbiological process'.

In a re-examination of Dr. Cook by Sir Lionel, consideration was given to Hackh's Chemical Dictionary, Julius Grant, Third Edition, Churchill (p. 187) 'Chemical, (1) pertaining to chemistry, (2) a substance of definite and known composition'.

Sir Lionel pointed out that this was a broader definition than Mr. Johnston had presented to the witness, namely 'a compound or substance of a definite molecular composition' which Dr. Cook had considered too restricted a definition. The definition in Hackh, however, continued.

> 'Generally the term *chemical* is restricted to a substance consisting of a single molecular species, while the term *drug* refers to a substance derived from the vegetable or animal sources and often a mixture of substances.'

Sir Lionel suggested that in this country from the point of view of nomenclature, a distinction was drawn between chemical and drugs, to which Dr. Cook agreed.

Prefers Other Books to Hackh's Dictionary

In response to further questions from Sir Lionel, Dr. Cook said he had seen Hackh's Dictionary in a chemical library, he had never used it and he personally would prefer other books. He had looked through a number of chemical dictionaries and he had not found the definition given in Hackh's.

Reference was again made to the Schedule of the Act with particular regard to 'All synthetic organic chemicals, etc.' (page 3, Part I). On p. 18 was 'formaldehyde-methylamine and other aldehyde-amine compounds polymerised or not'. Sir Lionel asked Dr. Cook whether the questions put to him by the BoT legal representative applied to these substances; the question for instance, of their containing a range of products having all sorts of qualities and different properties, and Dr. Cook said they would.

Asked whether he would like to hazard a guess as to how many specific items might come under all those headings (e.g. other aldehyde-amine compounds), Dr. Cook said he thought it could easily run into thousands. Of the variation of properties and gradations and variation of form, Dr. Cook stated that in the normal course of manufacture a very wide range of molecular weights would be obtained. The examples shown to him that day had all been extremes, but in the ordinary course of manufacture of polymers nothing like that range was obtained.

DCL PLASTICS GROUP DIRECTOR ON PRICES & AVAILABILITY

DIRECTOR of each of the three subsidiary companies of Distillers Co. Ltd., and managing director of the Plastics Group, Mr. Peter Anthony Delafield, gave evidence at the tribunal.

Examined first by Mr. S. Gratwick (for the complainants) Mr. Delafield said that polystyrene first came on to the market in this country in 1933 and had been imported from Germany. It was first made in this country in 1937 by Distillers Co. Ltd.

Mr. Gratwick asked about polystyrene productive capacity and referred to a suggestion made at the preliminary hearing that there might be difficulties of meeting 'the requirements of the plastics industry from UK manufacturers'. Mr. Delafield: 'I should say there would not be the slightest difficulty in meeting all the demands of this country from UK production.'

Mr. Gratwick: 'A word on price. What is the current price of the home-produced material?'—'It varies according to the colour, but taking that specimen there on the desk, the glass jar, the price is about 2s 7d per lb.'

'Can you give us information about the price at which one could import corresponding material?'—'Yes, at the moment between 2s and 2s 2d a lb., delivered to the consumer's works.'

'Polyvinyl chloride next. Can you tell us when that was first sold in this country?'—'In about 1937.'

'Again, was that by importation or manufacture?'—'That was by importation.'

'When was it first manufactured here?'—'It was manufactured during the early years of the war, in 1942 first, I think.'

'Was that by your organisation?'—'No, that was done by Imperial Chemical Industries.'

'Your organisation does now produce this material?'—'We do now; we started in 1947.'

'Again on productive capacity (p.v.c.), is there sufficient productive capacity to meet demands in this country?'—'Yes, definitely.'

'And so far as the foreseeable future is concerned?'—'It is difficult to answer categorically because demands are increasing all the time, but I am quite certain capacity can be expanded to meet them without difficulty.'

'And prices; what is the average price in this country?'—'The specimen there, about 1s 6½d a lb. at the moment.'

'And the corresponding material imported costs how much?'—'1s 4d; and I have just heard of a case somewhat below 1s 4d a lb. delivered consumers' works.'

Cross-examined by Mr. Johnston about the Distillers' book 'A career with DCL' which on p.8 states 'until the advent of synthetic chemicals and plastics, biochemistry was the basis of all DCL's operations.' Mr. Delafield was asked whether that was not a plain use of 'plastics' as contrasted with chemicals.

The witness said they were trying to explain to the very young that there was more than one branch of the chemical industry and it was divided for convenience.

Mr. Johnston suggested that the position was that trying to interpret the word 'chemicals' and its use in industry, it was quite arbitrary as to what was included and what was not.

To this Mr. Delafield said it was divided up for convenience sake. It was all part of the basic chemical industry, but as it had grown, it had hived off into departments.

After further questions about various substances, Mr. Johnston asked whether he could take the witness's evidence as being that DCL treated plastics as being part of chemicals, which Mr. Delafield confirmed.

Mr. Johnston then said that the company had in fact a chemical division and a plastics division, to which Mr. Delafield agreed.

Consultant Agrees with Oxford English Dictionary Definition of 'Chemical'

AGREEMENT with the definition of the word 'chemical' as stated in the Oxford English Dictionary was expressed by Dr. K. A. Williams, a consulting chemist in the firm of E. R. Bolton and witness for the four complainants.

Replying to Sir Lionel Heald's question on the operation from the technical point of view, of the words 'synthetic organic chemicals', Dr. Williams said that they removed from the wide area the natural products as such. Second, they removed the inorganic chemicals, so that one was restricted to organic chemicals, which were by modern definition carbon compounds; and then the words restrict that further to the synthetic chemicals; the ones, taking the broadest definition of synthetic, that were artificially made.

Asked what his view was regards the application of the word synthetic to polystyrene, Dr. Williams said he thought that it was a synthetic product, even in the more restricted form of the word synthesis, meaning a building-up; polystyrene was built-up.

Reference was made during evidence to the BDH Laboratory Chemicals Catalogue. Sir Lionel asked Dr. Williams whether this catalogue contained any of

the polymers the hearing was interested in. Dr. Williams referred to p. 156 of the first list; two polymers which were very close in composition to two of the polymers being discussed, polyvinyl acetate and polyvinyl alcohol. On p. 148, paraformaldehyde was listed with a formula showing it to be an indefinite polymer.

Later, Sir Lionel said that an objection had been raised to the polymers in question being described as chemicals, on the ground that none of them had a definitely ascertainable structure, nor a formula which could be precisely specified and that each consisted of a mixture of substances which had never had an independent existence, etc. If this were true of the polymers in question, was it also true of the polymers in Appendix 4 of the KID List? Dr. Williams confirmed this.

Paragraph 8 of the opponents case (see above) was quoted to Dr. Williams who was asked by Sir Lionel whether this statement would apply to melamine-formaldehyde adhesives. Dr. Williams agreed that it would, and when asked whether that statement was wrong or the Act was wrong, said that the statement was wrong. Whatever their use, these things were chemicals by reason of the manner in which they were made.

Varying Polymerisation

Asked whether the degree to which the polymerisation was carried out was a matter of importance, Dr. Williams said it was of great importance. By varying the pressure, the temperature and the time, a product of somewhat different characteristics could be formed.

In reply to a question as to whether the consistent characteristic could be maintained in relation to a particular product, Dr. Williams said that if the conditions of manufacture were repeated so the characteristics of the product would also be exactly repeated. With regard to the grades of polymer which were or could be produced, varying the conditions could change some of the physical properties. The grade was reproducible; it was necessarily reproducible in a commercial article.

In reply to a question as to whether polymers could be seperated, Dr. Williams said that usually they were not. It was a matter for research. He thought that methods were only just beginning to be found for carrying this out. If two batches were made in the same manner, they would separate out into the same fractions and in the same proportions.

Sir Lionel then quoted paragraph 13 of the applicants' case:

> 'The only issue to which the question of identification is relevant is whether a given chemical (not chemical compound be it noted) *can* be identified with precision and consistency.'

Dr. Williams agreed with this, and in reply to Sir Lionel's inquiry as to whether he had ever actually personally analysed any of the polymers, said he had not analysed any of the four polymers concerned, but within the ordinary limitations of analysis he could analyse a substance such as methyl methacrylate.

Asked to consider the applicants' statement that 'There is no difficulty here, e.g. polythene can always be identified and distinguished from a substance which is not polyethylene', Dr. Williams said he had no doubt it was true. Appendix 5 set out two methods of identification which in themselves were sufficient to identify polythene.

Sir Lionel questioned Dr. Williams on Hackh's Chemical Dictionary. Dr. Williams said he had not seen the dictionary itself and he had no idea of the dictionary's esteem. Sir Lionel then read the definition of 'chemicals' and Dr. Williams pointed out that what was written was inconsistent with the heading—the word 'chemicals' was in the plural, but it was defined in a singular sense.

Asked whether he knew of any other dictionary or document which suggested the second meaning relating to molecular species, Dr. Williams said he did not.

Mr. Johnston in his cross-examination dealt with questions on the analysis of polymers. After referring to the fact that Dr. Williams had never conducted an analysis on the polymers concerned, Mr. Johnston asked about the sort of ranges of molecular weight obtained in commerce. Referring to Thorpe, Mr. Johnston said he would give the range of figures:

'Polystyrol K, 10^6, one million'—'Yes.'

'Polystyrol L, 50-60,000'—'Yes,'

'About one-twentieth. It is 500,000, and Polystyrol 3 is 120,000.'—'Yes, I accept that'.

'Polystyrol 4 is 450,000'—'I accept the figure'.

Mr. Johnston: 'If it (polymethyl methacrylate) is made by casting—and my authority here is Dr. Yarsley's book—when it is made by casting the variation is from 180,000 to 300,000'—'Yes'.

'And when it is made by granular or suspension method it is 50,000 to 60,000'—'Yes'.

Reference was next made to polythene which in the form of waxes and greases had a molecular weight of 7 to 13,000 but there were more common types between 40,000 and 60,000 and by the Ziegler process, 3,000,000. Regarding polystyrene, said Mr. Johnston, Dr. Williams had stated that although two polystyrenes might have different molecular weights, they were the same chemical. Asked whether they also differed in structure—that the number of branches for low molecular weights might be more per unit length than for the higher—Dr. Williams said he was not prepared to talk about how many branches there were.

Dr. Williams was asked to consider ethyl alcohol and dimethyl ether which have exactly the same number of carbon, hydrogen and oxygen atoms, as also butane and isobutane. In the case of the first two, they were not the same chemical. In the second, the atoms were arranged differently so that chemical behaviour was different. Dr. Williams said the high polymers, however, behaved differently when presented to different chemical reagents, whereas the simpler examples did not.

Mr. Johnson continued to question the witness as to whether various substances were chemicals, on molecular structure and identification of chemicals.

Dr. Williams was also cross-examined by Mr. Graham, who referred to Beilstein's 'Handbook of Organic Chemistry', in which there was a note on polystyrene. Beilstein reported that the high molecular weight polystyrenes were attacked by bromine in solvents at ordinary temperatures, but the low molecular weight polystyrenes were substantially unattacked. This suggested that there was difference in chemical behaviour. It was contrary to what the witness would have expected.

ICI Plastics Division Director Gives Figures of UK Polymer Production

RESEARCH director of Plastics Division, Imperial Chemical Industries Ltd., Mr. H. C. Raine, during examination by Mr. S. Gratwick at the polymer tribunal, said he was unable to say which of four samples of film (of polystyrene, polymethyl methacrylate, polyvinyl chloride and polythene) were UK produced. Some were of UK production, and some were grades at present available in the US. These US grades he understood Bakelite and Monsanto intended to produce in this country. Alkathene Q23, Alkathene 7F and Alkathene Q623 were definitely made in the UK. He believed DY NH3 was made in this country now and also some members of the series.

Mr. Gratwick asked Mr. Raine if a manufacturer wanted a particular grade for a particular purpose, would there be any difficulty in supplying him? Mr. Raine suggested that they might have difficulty in the sense that they might not have immediately available a material which would behave in exactly the same way under a particular set of operating conditions at a particular rate to make a particular product, but this was rather a matter of convenience than a real difference. His company, he was prepared to go so far as to say, would find no difficulty in providing a material of characteristics suitable for any application.

Mr. Raine said he was responsible for work of identification of polymers, and in reply to a question on the reliability of methods of identification outlined in Appendix V, indicated that they were all methods he used and that they were reliable.

Asked whether the four polymers, taken as a group, were used by the plastics industry (the industry fabricating them for their mechanical properties) or whether their chemical properties also influenced their uses, Mr.

'These are Figures which are Not Always Released in Public' Mr. Raine

Raine said their chemical properties had a double importance. First, it was the chemical structure which determined in large measure their physical behaviour and furthermore in use the chemical properties were of importance. He gave as an example, polythene which could be used for making certain chemical plant, or under extreme conditions could be oxidised, which effect was used in the polythene film industry.

Answering Mr. Gratwick's inquiry as to whether that modification was a physical or chemical one, Mr. Raine said it was believed to be a chemical modification. It was an oxidation.

Dr. Cook in his evidence had mentioned the possibility of getting monomer from the polymer and Mr. Gratwick asked Mr. Raine's opinion on this. Mr. Raine said this was more than a possibility. It could most certainly be done, and taking polymethyl methacrylate as an example, he said that it was known that there were certain small chemical companies in Europe who bought up scrap polymethyl methacrylate and depolymerised by a simple process in order that they might cast sheets of the polymers for sale, and that was their source of monomer. It was not merely a remelting of the scrap. It was a thermal decomposition of the material. There was a chemical change and all those monomer units which were strung together were in the depolymerisation process broken off as individual and different molecules. Having got the monomer, it was repolymerised.

'And there are some people who think it economically worthwhile to do that?' —'Indeed, yes.'

Production Figures

'Now can you give me some figures on production. Are you able to give information as to the estimated total UK production of these four polymers?' —'I have some figures available.'

'First of all, polyvinyl chloride?'—'These must be estimates, because there is more than one manufacturer, but we think about 60,000 tons—it may be higher—per annum.'

'And polymethyl methacrylate?' —'About 15,000 per annum.'

'Polythene?'—'Polythene, 65,000 is the figure which I have in mind.'

'Finally, polystyrene?'—'Polystyrene; I am less well informed about that, but I do not think 25,000 to 30,000 tons would be very far wrong.

'I would like to ask you if you can give similar information about one or two of the materials which occur in the Schedule, the Key Industry list?'

Mr. Johnston asked if it were known where these import figures would have been obtained and was informed that they were believed to be derived from official figures.

Mr. Gratwick 'Would you turn to page 37, please. Near the top of the left-hand column is the word "urea." Can you say what the average production of that material is in this country?' —'Something like around 100,000 tons a year.'

'Taking another example, acetone—first of all, R acetone; that indicates the acetone of analytical reagent quality?'—'Yes.'

'Then we have acetone fermentation, acetone synthetic, acetone cyanhydrin.' —'Three of those, sir, are essentially the same compound, but acetone cyanhydrin is, I think, a different compound.'

'Can we take the second one, acetone synthetic; can you give a production figure for that?'—'About 40,000 tons a year.'

'Acetone fermentation?'—'I really do not know.'

'Phthalic anhydride, can you give a production figure for that?'—'That is in the same order, I think, of quantity production.'

Referee: 'What page is this?'

Mr. Gratwick: 'It is on page 28. That is the material you are talking about is it not?'—'It is.'

'What did you say the production of that was?'—'I think that is very much the same as acetone.'

'About 40,000 tons?'—'Yes.'

ICI's PVC. Proportion

In his cross-examination, Mr. Johnston asked Mr. Raine where his information came from generally. In reply, Mr. Raine said that p.v.c. was manufactured by more than one company in this country and therefore his figures could not be strictly accurate, because his company did not necessarily know their competitors' production, ICI's own production was a large part of it and the rest was derived essentially from general commercial information.

'That is what you have been told by other people?'—'That is right; by other manufacturers as well.'

'What is the ICI proportion of the total?'—'Around 45,000 tons.'

'Three-quarters, yes?'—'These are figures, I may say, which are not always released to the public.'

'It is very kind of you to release them today. Polymethyl methacrylate?' —'That is our own production. That is a fairly reliable figure.'

'And the polythene is your own? It cannot be all your own?'—'No, sir. The polythene figure is partly our own, and Bakelite are in production.'

'And you obtained the information from them, did you? Is it published information or just what they have passed on to you?'—'I think that the information about Bakelite's output has been published but in any case ICI's proportion is a very considerable part of that, around about 50,000 tons.'

'And the polystyrene—you said you did not know very much about that?'—'I think I gave that figure with all the qualifications as to my inability to answer properly.'

'Rather a guess, that one?'—'Yes.'

Asked by Mr. Johnston what was the general source of the information on the figures for urea, acetone and phthalic anhydride, Mr. Raine said those were largely his own company's information.

Continuing the cross-examination, Mr. Johnston asked Mr. Raine about the ICI book 'Polythene', by Renfrew and Morgan, and the following passage on p. 223:

> 'Until recently melt flow index has been accepted as the unique characterising test for polythene but the current trend is to attach less importance to it. This has followed from the realisation that it does not completely fix the properties of a polythene and that it is perfectly feasible for two polythenes of identical melt flow index and density to have widely differing physical properties and flow properties, as, for example . . .'

Mr. Raine agreed with that. Mr. Johnston then referred to Mr. Raine's evidence earlier on oxidation of polythene for film. Mr. Johnson also noted evidence about depolymerisation of these substances. If one tried to depolymerise the various forms of polymethyl methacrylate meaning, isotactic, syndiotactic and atactic, could anything be said about the relative ease of depolymerising those different kinds of polymethyl methacrylate?

Mr. Raine said he could say something about atactic, but isotactic and syndiotactic methyl methacrylate polymers were not even well established scientifically. No work had been done on them at all.

ICI's Isotactic Research

In cross-examination by Mr. Graham, Mr. Raine stated that ICI had actually done some research on the various isotactic forms of methyl methacrylate and referred to the paper by Miller *et al.* Mr. Raine said it was an alleged isotactic form.

'You are not satisfied it is?'—'Polymethyl methacrylate has been obtained in two crystalline forms, and that is what those authors are essentially reporting.'

'You are not satisfied?'—'I am not entirely satisfied, no, but there is no reason why they should not publish their works.'

'. . . Do you know a firm named Greenwich Plastics Ltd.?'—'I know of them, yes.'

'I think they are a subsidiary of Commercial Plastics, one of my clients.' —'Commercial Plastics.'

'Do you remember receiving a request from them somewhere I think about 1957, to see whether your firm could supply p.v.c. which would be an adequate substitute for a German p.v.c. which was called Vinoflex B.377?'—'B.377 means nothing to me, but the inquiry I do know about.'

'And you know the German polymer I am talking about, whatever its name is?'—'I have never heard it under that description.'

'How do you describe it?'—'I thought it was BASF polyvinyl chloride mark L.'

'That may be. Will you say what BASF is?'—'Badische Anilin-und Soda-Fabrik.'

'. . . My information is that you were sent samples of a plastic which I understand was called Vinoflex B.377 made by BASF. Do you remember?'—'This may be my own ignorance . . .'

'And that p.v.c. you were told, was for use for a special callendering process which I believe is known by the name Luvitherm?'—'Yes.'

'Greenwich Plastics were anxious, if they could, to use an English product?'—'If they were able to do so.'

'. . . As a result of that inquiry your firm supplied a grade which was supposed to be the same?'—'I will not agree that, sir; it was supposed to be suitable for the job. We would not claim it would be the same.'

'. . . Can you tell me this. Did you supply something that was supposed to have the same K index?'—'Yes, I think we did.'

'. . . You supplied something which was supposed to have the same K value as the German product. You were satisfied it had, were you?'—'Yes.'

Mr. Raine was asked if he knew what happened as a result of the trials by Greenwich Plastics and stated that the first trial was unsuccessful but later reports had suggested that ICI had been able to supply something which was satisfactory. Mr. Johnston said that his information was to the contrary and that Greenwich Plastics were still hoping that ICI would be able to supply them with an adequate substitute. If such a substitute were not found and the German material could not be imported, Greenwich Plastics were going to be in a difficulty.

Returning to the question of identification of polymers, Mr. Johnston suggested that polythene was a term which covered an infinite number of mixtures of polymers of ethylene, which Mr. Raine confirmed, saying he did not suppose there was a real upper limit. Mr. Johnston then stated that each of the mixtures contained an unknown number of different macromolecules, which had never been isolated, and Mr. Raine agreed.

Mr. Raine said that if he put it in his own words, he would say that the term polythene covered a range of substances exhibiting a range of properties.

Professor Bawn Questioned on Molecular Weights of Polymers

TECHNICAL polymer expert at the tribunal on polymers was Professor C. E. H. Bawn, Grant-Brunner Professor of Inorganic and Physical Chemistry at Liverpool University. Asked to define a polymer, by Mr. S. Gratwick, Professor Bawn said a polymer was formed by the union of small molecules together; in the simplest case the union of small molecules might give a linear chain-like arrangement, but it was possible to have arrangements in three dimensions. In support of his definition the professor referred to D'Alelio's 'Fundamental Principles of Polymerisation', p. 18, and to Tompa's 'Polymer Solutions', p.1, where it is stated:

> 'From a practical point of view it is inappropriate to describe the molecules as polymer molecules if they consist of two or three units; on the other hand molecules containing 50 or 100 units are definitely polymer molecules.'

Asked what he would say as to chemical analysis of two samples which might have different molecular weights, Professor Bawn said they would be of the same empirical formula from a direct elemental analysis, and to the question whether such a material fell within the words which occurred in the Board of Trade's case, 'a definite molecular composition', the professor stated that there had been discussion in the case of one of them, polythene, as to some degree of branching which might slightly modify the empirical composition, although he was doubtful if that was detected by a non-experimental method. Professor Bawn said that the four polymers in question had a definite molecular composition. Polymerisation could be reproduced to give the same distribution of molecular weights which could be measured, and in many cases could be predicted and confirmed experimentally.

In reply to Mr. Gratwick's enquiry as to whether the certainty was sufficient to enable a commercial producer to be able to reproduce material, Professor Bawn said he thought so.

It had been suggested to Dr. Cook, said Mr. Gratwick, that two substances of different molecular weight could not be the same chemical. Professor Bawn said they could have the same chemical properties. With regard to isotopes, chlorine gas was a mixture of two isotopes of molecular weights 35 and 37—different molecular weights—but no one would dispute that the two isotopes were absolutely identical in chemical properties. The difference in molecular weight of the two isotopes was purely a physical phenomenon.

After further questioning on molecular weights and physical properties, Professor Bawn was asked whether he would expect to find a great difference, indeed any difference, between two samples of polystyrene, one having a molecular weight of 100,000, and the other 200,000, and the professor said he would expect very little difference indeed.

Professor Bawn was then questioned about the substances in the Key Industry Duty List noted on p. 18:

> 'Formaldehyde-methylamine and other aldehyde-amine compounds polymerised or not and fatty acid compounds or addition products thereof: acetaldehyde-aniline compounds; butyraldehyde-aniline compounds; formaldehyde-aniline compounds; formaldehyde-methylamine compounds; other aldehyde-amine compounds.'

Did he consider that collection of substances to be different from the high polymers and other polymers he had mentioned? These materials were a class of compounds which formed condensation polymers, stated Professor Bawn. They were different from the four materials in question in that they formed cross-linked polymers as distinct from materials which formed linear polymers. The four polymers were not cross-linked nor were the normal products of commerce. Cross-linking could be induced and he knew how to do that.

Replying to a question as to whether among a range of polystyrenes of different molecular weights the same ranges of mechanical properties could be found, Professor Bawn said yes.

Asked whether he would expect to find a similarity in the physical properties of the kind of refractive index, optical rotation, and so on, the professor said that these were the properties which were largely independent or almost entirely independent, when the molecular weight was high.

Professor Bawn was asked whether cellulose acetate, cellulose ethers, etc., were high polymers. He said they were all high polymers derived by chemical means from natural cellulose. Cellulose acetate was a definite chemical substance. It was manufactured according to the number of acetyl groups, and analysis would give definitely the number of acetyl groups involved. Each acetyl compound would be different.

Mr. Gratwick enquired if one or other of the samples of cellulose acetate with their different lengths of molecule in the cellulose side of it were considered, had those different molecules ever had a separate existence? Professor Bawn said never.

The chemical behaviour of polymers of paraformaldehyde was also considered and stated to be the same even though one might have 100 units and the other 200 units. On the question of identification of the four polymers, Professor Bawn said he was satisfied that he could identify any one of them.

In answer to paragraph 4 of the BoT case regarding the BoT definition of a synthetic organic chemical, Professor Bawn said with reference to polystyrene and the other three polymers involved, that he considered these had been produced by synthesis, to have a definite molecular composition and to consist of a single molecular species.

The report of the examination of Professor Bawn and of other witnesses at the hearing will be continued in 'Chemical Age' next week.

Physical Society Exhibition

Physical Society's exhibition of scientific instruments and apparatus is to be held at the Royal Horticultural Halls, London SW1 from 19 to 22 January 1959. The opening ceremony will be performed by Sir Cyril Hinshelwood on 19 January at 11 a.m. Demonstration-lectures will be given on 19, 20 and 21 January at 5.45 p.m. on 'Physics of controlled thermocular fusion,' 'Frontiers of space' and 'Physical science in the Trans-Antarctic Expedition' respectively.

RECORD YEAR FOR FERTILISER DELIVERIES SAYS FISONS' CHAIRMAN

TOTAL consumption of fertilisers in the UK in the year ended 30 June 1958 could not be compared with that of the previous year, reported Sir Clavering Fison, chairman of Fisons Ltd., in his annual review of the company, as the completed figures are not yet available. Sir Clavering states, however, that there has been another substantial increase in the total tonnage of plant food consumed. Fisons' own deliveries have reached the highest level so far recorded.

An analysis of the increase in fertiliser consumption indicated that there may well have been a significant increase in the use of fertilisers on temporary grass. The average plant food content of compound fertilisers had continued to increase, and Fisons had therefore introduced more concentrated fertilisers, such as '41' compound. This compound is reported as having met with considerable success. Weather conditions last year favoured the application of basic slag to grassland and this material had been in strong demand.

Increased sales in Fisons' horticultural products have been noted; particularly in demand have been liquid fertilisers.

The new nitrogen factory at Stanford-le-Hope is stated by Sir Clavering to be nearing completion and is expected to be in operation early in the new year. As this will be a few months later than was hoped, it will contribute little, if any, to the company's profits from this source during the current year. The plant will produce 140,000 tons of ammonium nitrate a year which will be despatched in the form of a hot solution, of 86 per cent concentration, to the company's existing fertiliser works, for the production of concentrated compound fertilisers. These compounds will have nitrogen present in two forms—ammoniacal and nitrate.

Second Acid Plant

During the year under review, a second sulphuric acid plant at the Immingham factory has been commissioned. The acid plants at Immingham, Fisons believe, are among the most efficient and economical in the country.

Referring to Fisons' reduction in prices of their fertilisers, Sir Clavering says that this has resulted from the fall in cost of some of the raw materials used, in particular phosphate rock. Failure of the North African phosphate rock prices to fall further has been occasioned, however, by the existence of a monopoly selling organisation which it is hoped that the developing buyers' market in Western Europe will break down. Supplies of this raw material continued to give some anxiety due to the political situation in North Africa. It was noted that new sources of supply will be available in Africa within a few years, and that there will also be increased supplies available from the US, and perhaps from Russia. Such are the company's requirements that mining operations for rock are justified, if suitable deposits are found.

Sulphur prices have fallen, also, due to the competition between US and Mexican producers, and to low freights.

A sharp drop in demand for compound fertilisers in South Africa has occurred, but this has been offset to some extent by a rise in the sales of straight fertilisers, particularly superphosphate.

Conditions in Canada, in so far as Fisons' associated company, International Fertilisers Ltd., is concerned, have improved and the profit earned is the highest since 1953. Profits of Fisons (Pty) Ltd. in South Africa had fallen, in comparison with the previous year. The new factory at Sasolburg, Orange Free State, has progressed satisfactorily and is expected to be completed in the early part of next year. In Rhodesia, Fisons Fertilisers Ltd. have achieved increased sales.

The position of the various interests, grouped now under the Chemical Division (Genatosan, Benger's and Whiffen and Sons), is reported as having shown a continuous improvement. Trading results as a whole since the constitution of the division (1 January 1958) have shown a profit for the year under review. Fisons Pest Control Ltd. is reported as again showing a substantial loss due mainly to intensified competition in overseas markets. Benger's Ltd. have had a 'remarkably successful year'. Profits of Genatosan Ltd. have been 'seriously affected' by the rise in promotional costs, common to the industry. Loughborough Glass Co., a subsidiary of the Genatosan group, has continued to progress.

Due to the decline in Whiffen and Sons' established business in pharmaceutical chemicals, the decision was taken to close down the Fulham works and to concentrate it at Loughborough. The loss incurred is offset to a considerable extent by a large capital profit on the sale of the site and release of nearly £250,000 of working capital.

Turnover of Fisons Chemicals (Export) Ltd. has been the largest ever achieved. The policy of overseas expansion, particularly in Australia, Canada and India, is being continued.

Murgatroyds Salt and Chemical Co. Ltd., jointly owned with Distillers Co. Ltd., had a very satisfactory year, with higher production, sales and profits.

Drop In UK Acid Consumption

CONSUMPTION of sulphuric acid and oleum in the UK in the third quarter of this year totalled 515,441 tons, compared with 538,649 tons in the previous quarter, according to the returns of the National Sulphuric Acid Association. Total capacity represented in the returns was higher, as follows:—

	1 July-30 Sept. (Tons of 100% H_2SO_4)	1 April-30 June
Chamber & tower only ...	151,380	160,170
Contact only	557,780	541,090
Chamber, tower & contact	709,160	701,260

These summaries exclude all Government plants.

SULPHURIC ACID AND OLEUM

1 July to 30 September (Tons of 100% H_2SO_4)

	Chamber & Tower only	Contact only	Chamber, Tower & Contact
Stock at 1 July] ...	26,367	74,668	101,035
Production	101,896	406,348	508,244
Receipts	12,159	27,000	39,159
Oleum feed ...	—	959	959
Adjustments ...	−292	−580	−872
Use	65,180	244,899	310,079
Despatches ...	53,568	185,490	239,058
Stock at 30 Sept ...	21,382	78,006	99,388
Capacity represented	151,380	557,780	709,160
Percentage production	67.3%	72.9%	71.7%

UK CONSUMPTION

Trade Uses	1 July-30 Sept. (Tons 100 % H_2SO_4)	1 April-30 June
Accumulators	2,804	2,964
Agricultural	7,112	350
Dichromate & chromic acid	3,612	4,655
Bromine	3,175	2,464
Clays (Fuller's earth, etc.) ...	2,761	2,291
Copper pickling	529	508
Dealers	2,533	2,715
Drugs & fine chemicals ...	4,173	4,801
Dyestuffs & intermediates ...	17,699	18,878
Explosives	2,504	2,670
Export	649	581
Glue, gelatine & size ...	98	151
Hydrochloric acid	12,171	12,897
Hydrofluoric acid	2,243	2,618
Iron pickling (inc. tin plate) ...	25,567	27,847
Leather	1,017	1,158
Lithopone	2,405	3,188
Metal extraction	633	560
Oil refining & petroleum products	13,485	12,370
Oils (vegetable)	2,431	2,670
Paper, etc.	1,752	1,543
Phosphates (industrial) ...	37	56
Plastics, not otherwise classified	9,075	10,492
Rayon & transparent paper ...	54,239	61,727
Sewage	2,463	2,495
Soap, glycerine & detergents	26,395	28,926
Sugar refining	158	128
Sulphate of ammonia ...	66,123	70,990
Sulphates of copper, nickel, etc.	2,491	3,308
Sulphate of magnesium ...	23	27
Superphosphates	114,081	117,921
Tar & benzole	6,853	7,985
Textile uses	2,572	2,595
Titanium dioxide ..., ...	74,828	74,487
Unclassified	46,750	49,633
Total	515,441	538,649

RAW MATERIALS

(Tons)

	Pyrites	Spent Oxide	Sulphur Imported	Sulphur Recovered H_2S and Filter Cake	Zinc Concentrates	Anhydrite
Stock at 1 July	193,925	103,242	64,089	8,912	114,657	15,117
Receipts	75,791	52,057	85,705	11,456	15,822	175,856
Adjustments	+417	+35	−46	+31	+1,529	—
Use	74,333	50,680	61,603	10,853	36,809	178,785
Despatches*	1,608	4,814	1,896	9	—	—
Stock at 30 September ...	194,192	99,840	86,249	9,537	95,199	12,188

* Including uses for purposes other than sulphuric acid manufacture.

General view of production area

Gomia Explosives Plant Draws Materials from Nearby Sources

MANY of the raw materials required by the new explosives factory at Gomia, Bihar, India (see CHEMICAL AGE, 8 Nov., p. 773) are supplied from other factories only a few miles distant, and the main market outlets are easily accessible.

Gomia is a few miles down-stream from the Konar Dam and the controlled flow provides a steady supply of water. All the necessary electric power is supplied by the Bokara thermal power station which is only a further 10 miles down-stream.

Liquid ammonia, one of the principal raw materials, comes from the fertiliser factory at Sindri while glycerine is supplied by soap manufacturers in Calcutta.

The factory area is divided in two by a hill. In the non-danger area sulphuric acid, nitric acid and ammonium nitrate are produced and units concentrate these acids and denitrate refuse acid from the nitration process. Also in this area are the laboratory and equipment for making paper shells, wooden cases and preparing non-explosive ingredients.

Processing of Explosives

Explosives processing is carried out in the danger area, where the first step is manufacture of nitroglycerine by the Biazzi process. Glycerine and mixed acid are fed continuously in accurate proportions to a 'nitrator,' in which very rapid reaction takes place, and the mixture overflows to a separator where the heavier refuse acid settles out and is run away while the nitroglycerine overflows to a series of washing vessels for purification. Refrigeration plant provides brine at −2°C for cooling the nitrator.

In the event of any irregularity or abnormality in the process a security system acts automatically to render the process safe. Measuring instruments, automatic switches, etc., are interlinked to give visual and audible warning and, if necessary, to stop the process or, in case of a serious hazard, to discharge all nitroglycerine into a large volume of water to prevent it from reaching an excessive temperature.

After final purification, nitroglycerine is weighed out in batches as required for explosives and transported to the mixing house. Other solid ingredients are weighed out, mixed and sieved and passed over strong magnets to remove chance pieces of iron and steel, after which the mixture is transported to the mixing house where the bulk explosive is provided.

When mixing is complete, the batch is dropped into trucks which are taken to cartridging houses where the final packing operation is completed.

Courlene X3 Output to be Doubled Next Year

OUTPUT of Courlene X3, the high-tenacity polythene yarn developed by Courtaulds Ltd., is expected to be doubled by early 1959, after a further expansion takes place at the Little Heath, Coventry, factory of British Celanese Ltd. Present production is largely in the form of monofils, but multifilament yarns, which have recently been introduced to the trade and are finding increasing use in many different industries, will account for an expanding proportion of future output.

New advances in plant design and production techniques are being incorporated in the expansion, and it is expected that the physical properties of Courlene X3 will be improved still further. New production equipment has been designed by the company's technical staffs, and is being built and installed by Courtaulds Engineering Division.

Poisoned Nickel Catalysts

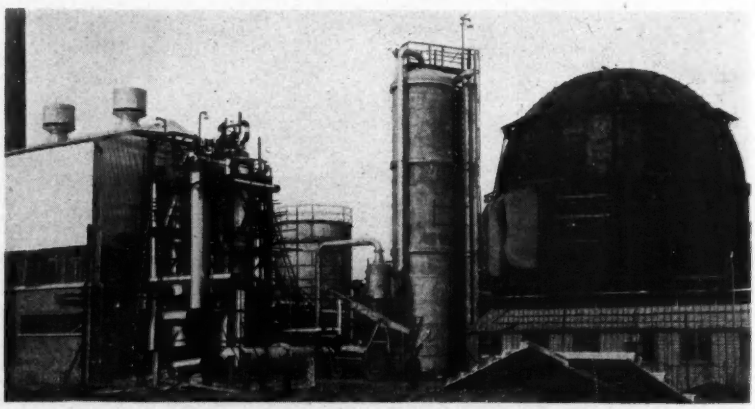
Treatment with liquid formic acid restores to the active condition nickel, copper, cobalt or iron catalysts which have been poisoned by metallic sulphides during hydrogenation or dehydrogenation, it is claimed in BP797,111. Formic acid is passed over or through the catalyst in a current of an inert carrier gas. The flow of formic acid is then discontinued and excess acid, together with the hydrogen sulphide formed, is driven off by the passage of inert gas or hydrogen. It is emphasised that the formic acid must be maintained in the liquid state.

Fisons New Nitrogen Factory

FISONS new nitrogen plant at Stanford-le-Hope on the Thames estuary, is nearing completion, and is expected to be in operation early in the New Year. The plant will produce 140,000 tons of ammonium nitrate a year in the form of 86 per cent solution. The manufacturing process employed will be the catalytic oxidation of ammonia to nitric acid, followed by neutralisation of the acid with more ammonia to give ammonium nitrate.

The solution will be despatched hot to the company's factories for use in the production of concentrated compound fertilisers.

Shown here is part of the process and storage installation, with, to the right, the ammonia storage sphere, the largest of its kind in the country, with a capacity of 2,000 tons. Next to the sphere can be seen the absorption column for the conversion of nitrogen oxides into nitric acid.



Right is largest UK ammonia storage sphere

HEALTH HAZARDS IN THE UK CHEMICAL INDUSTRY

Chief Inspector's Report for 1957

INADEQUATE provision for first aid treatment was one aspect of the problem of industrial accidents stressed in the annual report for 1957 of the Chief Inspector of Factories on industrial health. Although in many instances a first aid box was available, the contents were either far from sterile or comp'etely inadequate, and very often the trained personnel were insufficient in number.

In the section dealing with industrial disease and poisoning, figures for 1957 are given and compared with earlier years. Lead poisoning is still the most common form and the number of cases has increased from 49 (one fatal) in 1956 to 55 in 1957. Many of these are considered in detail in the report and show in how many industries such a hazard exists.

Phosphorus poisoning, resulting in necrosis of the jaw, was reduced from six cases in 1956 to three in 1957. Two of these were process workers working in a plant where elemental phosphorus was purified. Phosphorus fume was present in the atmosphere of the purifying plant in amounts largely dependent on weather conditions. Ventilation had recently been improved and the risk of contact reduced by enclosing the mud waste in piping. The other case reported was also a process worker, who for eight months had been exposed to fumes of phosphorus pentoxide.

Mercurial Poisoning

There was a notable rise in the number of cases of mercurial poisoning from two to 12 and in these the symptoms and conditions varied considerably. Five of them occurred in a newly erected plant and were attributed to spillage of mercury during installation and intense preliminary production. Mercury-in-air estimations had been made regularly by an ultra-violet light method, but the monitor had been wrongly calibrated on the premises.

From another factory where medical supervision was carried out, three men, whose work included the exhausting of air from glass bulbs by means of about 900 mercury pumps, were taken off processes involving exposure to mercury after tests had shown a positive increase in their mercury intake. Cleaning of the mercury pumps was carried out in fume cupboards under powerful exhaust ventilation. It was shown that mercury vapour from spillage in the fume cupboard escaped into the workroom when the ventilating fan was switched off, whether or not the fume cupboards were in use. It was arranged, following the occurrence of these cases, that the exhaust ventilation should be working constantly and efforts were made to reduce spillage of mercury in the fume cupboards.

Another three cases occurred in the manufacture of thermometers in three different factories.

Of the 16 occurrences of aniline poisoning mentioned in the report, seven occurred in the same chemical works and of these, three were maintenance men who had been exposed to fumes of *p*-nitrochlorbenzene while carrying out repairs to a crystalliser. The vessel was drained and steamed out but while it was still hot the men loosened bolts in the bottom plate to save time, resulting in some leakage and considerable fumes.

In another works, nitrobenzene splashes on clothing had caused the poisoning. One unusual case is reported of a coloured worker in whom cyanosis was not immediately obvious, but who was given immediate treatment after being splashed with aniline.

Gassing accident figures have remained remarkably constant over the post-war period. During 1957 there were 232 of which 22 were fatal. Carbon monoxide is the greatest single cause of gassing accidents but the number of these is being steadily reduced. Only those accidents having special medical interest are described in the report.

Delayed effects of phosgene gas are illustrated by an accident in which a chemical plant worker was exposed to the gas for only a few seconds and no immediate treatment was considered necessary. Later that evening he complained of feeling ill and was detained in the works surgery for three days.

Trichlorethylene fume caused an outbreak of gassing at a factory where five cases were reported and 17 other women were affected. Mass hysteria as a contributory cause was dismissed after careful investigation and it is possible that the warm damp atmosphere had produced a high local concentration at breathing level.

Hydrazoic Acid

As the result of two chemists being rendered unconscious by hydrazoic acid the whole process of formation of a diazide compound will now be carried out in a fume cupboard. The accident occurred while the reagents were being centrifuged and this part of the process had not been done in a fume cupboard although the earlier stage had been.

Isocyanates, which are finding an increasing industrial application, are a class of toxic materials and typical effects are asthmatic. Toluylene diisocyanate had in one reported accident affected 15 men of whom several required hospital treatment.

Full protective clothing, including goggles, is recommended for those liable to contact dimethyl sulphate. One accident mentioned in the report happened during the piping of the liquid from a drum to a storage tank. The connecting tubing was changed during the operation and the worker subsequently developed severe conjunctivitis.

An autopsy on a painter who was removing old paint with a chemical stripper in a confined space revealed that the blood was dark, indicating a shortage of oxygen. The pathologist gave the cause of death as narcotic poisoning by inhalation, and evidence was given that the paint stripper contained methyl chloride, methyl alcohol and benzol.

Inadequate ventilation seemed to be the factor common to all cases of suspicious symptoms where benzene was being used, but no serious accidents are reported.

Notifications of dermatitis have declined in the past few years but it is pointed out that these notifications are voluntary and are dependent on the co-operation of the factory employers.

Causes of industrial dermatitis are multiple but the most common are: mineral oil; chemicals such as alkalis, chromic acid, chromates and dichromates, nickel salts, chlorinated naphthalenes and diphenyls, formaldehyde, some synthetic glues, resins and hardeners and certain rubber accelerators; solvents and degreasers; and coal tar products.

Dermatitis is not contagious but secondary infection of traumatic injury may result in dermatitis. Mineral oil effects are very common but seldom seem to cause absence from work, although with prolonged exposure conditions more serious than dermatitis, such as epitheliomatous ulceration, may be caused.

Prevention of dermatitis requires a planned and co-operative effort by both employer and employee. In devising adequate methods of protection for workers, medical inspectors can do much to he'p employers.

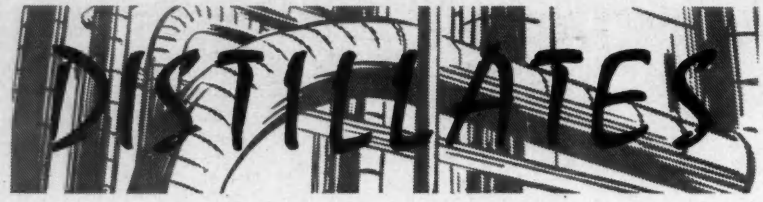
Rehabilitation after dermatitis is dealt with in the final paragraphs of the report.

UK Designed Plant Works at Above Rated Efficiency

THE vinyl acetate plant of C.S.R. Chemicals Pty. Ltd. at Rhodes, New South Wales, built with technical assistance from British Celanese Ltd., is reported to be operating at a higher rate of output and efficiency than was specified in the contract.

This is the third vinyl acetate plant which has been based on research done at Spondon by British Celanese, the other two being the Spondon plant itself and that built by the Celanese Corporation of America. Although the US plant was the first to be built, the research behind it was wholly British in origin.

The Australian plant, which started production in August this year in advance of the contract date, should be able to meet anticipated Australian demand for vinyl acetate for some years to come. The cost of the project is put at about £A500,000. The bulk raw materials used for producing vinyl acetate at this plant are acetic anhydride and acetaldehyde. These two chemicals are made in other C.S.R. chemical plant from alcohol derived from sugar cane molasses.



★ AMONG the mass of documents quoted from at the tribunal hearing this week and last on polymers (see p. 797 for report) one in particular was the subject of tributes. This is 'Plastics in the Service of Man,' one of the Pelican series by Dr. E. G. Couzens (Bexford) and Dr. V. E. Yarsley.

When Dr. K. A. Williams was in the witness box, Sir Lionel Heald, QC, appearing for Bakelite, Distillers, ICI and Monsanto, said that it seemed that everyone in court except himself was aware of the book. It was included in the documents of the counsel for the opposition and he had obtained a copy the previous day and had sat up until after 2 a.m. reading it.

Sir Lionel commended it to the attention of the referee, Mr. A. W. Roskill, QC, as a very good book from the non-academic point of view. Mr. Roskill said he would read it. Dr. Williams thought that not only was the book good from the layman's point of view but that it was also of value to those in the chemical industry.

★ AS A result of talks between the Scientific Instrument Manufacturers' Association and some of the large instrument users, regular liaison among UK manufacturers concerned with instruments is planned through the Engineering Equipment Users' Association. Among companies expected to take part in developing this scheme are the Distillers Company and ICI.

This move follows the highly successful SIMA convention which ended at Harrogate on 9 November, when makers of instruments and users in a number of industries, including chemicals, held special discussion meetings to discuss problems under four headings: Plant instrumentation; future trends and automation; laboratory instrumentation; instruction manuals, installation and servicing.

A main basic requirement for the chemical industry for the future is for accurate rugged instruments to monitor continuously the end-product and to provide fast 'feed-back' controlling input of materials and adjustments of machines along the processing line.

★ THE development in recent years of methods for the manufacture of high quality synthetic optical dispersion media has provided the opportunity for new advances in spectroscopy. Outstanding among these new materials is high quality fused silica, recently available in commercial quantities. Previously, prisms for u.v. spectrometers were made almost exclusively of natural quartz, which is subject to trace impurities and which presents limitations in cutting.

Synthetic silica, while being chemically identical with pure natural quartz can be manufactured under controlled conditions so that no impurities are introduced; being amorphous, it can be cut without difficulty in any orientation. Because of its high purity, fused silica has considerably better transmitting properties in the u.v. region of the spectrum than natural quartz.

For this reason, Unicam Instruments Cambridge, have recently replaced the quartz prism in their SP.500 u.v. spectrophotometer with a prism of the new material. As a result the useful range of the instrument has been extended from 200mμ to the region of atmospheric absorption at 186mμ. Performance in the important 200-500mμ range is stated to have been greatly improved.

★ A FURTHER bulletin on the Soviet chemical industry published recently in Moscow by the Trade Ministry states that during the next eight years some 120 new chemical installations will be set up in the USSR. The cost of these are to be borne partly by a large-scale reduction of State investment in the coal- and lead-mining industries. Stress is now being laid on production of synthetic fibres and plastics, fields in which the Soviet Union is about 15 years behind the UK.

Work has already begun on expanding the exploitation of raw materials, notably mineral oil and natural gas. Less simple has been the planning of a large enough supply of new equipment for the synthetic fibre industry, which by 1965 is planned to produce five times the current output. Some of the equipment, which will be fully automatic, will be purchased in West Europe.

The Soviet Government has recently handed a note to Dr. Adenauer reminding him of previous decisions for the exchange of technical help between the two countries. The note is interpreted in Bonn as a hint that such help would be most appreciated in the chemical industry for the USSR is said to be anxious to return to the mutual help conditions that existed in this industry particularly during the period 1924-1930.

★ VALUABLE work on the structure of liquids has been carried out recently by Professor J. D. Bernal of Birkbeck College, London University. According to a scientific correspondent in the *Observer* on Sunday, Professor Bernal has now put forward a new theory in which he claims to have finally identified the missing pattern that gives liquids a unique identity compared with solids or gases.

The molecules of liquids neither follow the rigid pattern of solids, nor are they completely divorced from their neighbours as in gas. The molecules in a liquid are in direct contact with each other with uneven forces pushing and pulling them from every direction. Professor Bernal believes that these molecules form a pattern but that it is an irregular one which never repeats itself.

Liquid structure is, he thinks, based on a pentagon, a shape that it is almost impossible to build into a regular pattern. This is probably the underlying reason why liquids flow. A liquid becomes a gas at the point where the molecules, overcome by heat, begin to thin out and to break up into small groups. Professor Bernal's next step is to reduce the theory to a formula that can be expressed mathematically; even with computers this is expected to take between two and three years.

★ SOLUTION of one of organic chemistry's classic problems, total synthesis of yohimbine, has been reported by chemists at the University of Wisconsin led by Professor Eugene van Tamelen.

Yohimbine, an alkaloid, was first isolated as a pure substance in the 1890's. Since then organic chemists have tackled the synthesis problem without success until the breakthrough by van Tamelen and his collaborators at the University of Wisconsin, and the synthesis task began in earnest in 1954.

A series of 20 steps was required and chief among many complicating factors was the order of reduction of the yield after successive processes. Beginning with pounds of starting materials, the unit of quantitative measurement shrinks to milligrams in the latter stages.

Butadiene and quinone were the starting materials, and finally this autumn, after re-runs at virtually every stage in the process, the project was completed and a preliminary report published. The synthesis of yohimbine is significant because it is a member of a family of alkaloid materials which are physiologically active.

Reserpine, famous as one of the first tranquilisers, is very similar chemically to yohimbine. But its effect on the body is vastly different. Yohimbine is an aphrodisiac.

Alembic

DETERMINING TRACE IMPURITIES IN METALS

Bagshawe at Midlands SAC Meeting

THE usual methods of steelworks analysis were not, as a rule, sufficiently sensitive for accurate determination of trace impurities in ferrous metals, said Mr. B. Bagshawe (Brown-Firth Research Laboratories), when opening a recent discussion on 'The determination of trace impurities in metals', held by the Midlands Section of the Society for Analytical Chemistry at Coventry. Suitably modified or specialised procedures were necessary.

Ways in which an approach could be made towards achieving any required standard of accuracy were:—

(1) Use of group separations as 'concentration' procedures, e.g. ether or amyl acetate extraction of iron, mercury cathode separation. This type of procedure enabled the necessary sensitivity to be achieved through use of large initial sample weights.

(2) Solution spectrographic methods.

(3) Use of specific colour reactions of sufficient sensitivity to permit determination of minor concentrations of the element being sought without recourse to use of large weight or concentration procedures.

Concentration Procedures

In the case of concentration procedures, ether extractions of iron could be made on quite large samples, e.g. 10-25 g. samples were comparatively easy to handle and even 50 g. samples were used on occasions. Trace elements that could be determined at high sensitivity by normal methods after a large weight ether separation included manganese, chromium and nickel, copper and cobalt. The standardisation certificate for B.C.S. 260/1 Pure Iron was shown in order to indicate the degree of concordance which could be achieved by different investigators for these elements when such methods were used. For pure iron and simple steels ether separation might be the only preliminary separation required, but for alloy steels there was also the problem of removing large concentrations of chromium, nickel, etc., and it was usual, therefore, to combine the ether separation of most of the iron with a mercury cathode separation to remove chromium, nickel and the remaining iron. With 20 g. samples a single extraction with ether was about 95 per cent efficient, i.e. the iron concentration was reduced to about 1 g. and removal of this, if necessary, was well within the compass of a mercury cathode separation.

The residual electrolyte could be used for determination of aluminium, titanium, vanadium or zirconium by the usual methods. On 20 g. sample weights aluminium could be determined as low as 0.005 per cent by the oxime method, titanium and vanadium as low as 0.002 per cent by the peroxide colour method and zirconium to about 0.01 per cent by precipitation with cupferron and subsequent conversion to phosphate.

Another concentration procedure which was sometimes useful was to precipitate the trace element required as sulphide, together with a carrier sulphide. This was the principle adopted in the B.S. method for tin in steel, molybdenum being the carrier sulphide. In addition to tin, the same principle could be adopted to separate traces of arsenic, cadmium, copper or lead.

Turning next to solution spectrography, Mr. Bagshawe said that direct spectrography of solid samples could be, and often was, used in analysis of steel for trace elements, but its application depended on provision of chemically analysed samples as calibration standards. Limitations were therefore imposed, depending on the accuracy of available chemical methods. Solution spectrography opened up a much wider range of application because the technique could be calibrated with relation to synthetic standards prepared from pure chemicals and it was, therefore, independent of chemically analysed samples. The other principal advantage was that a preliminary concentration of the element required could be made and the increase in spectral sensitivity which resulted enabled a much higher accuracy of determination to be achieved.

Solution Methods

The B.I.S.R.A. Spectrographic Analysis Sub-Committee[1] recently investigated the application of solution methods with particular reference to elements which were difficult to determine chemically at low percentages. Direct solution of the steel in perchloric acid, without any chemical separation, followed by absorption of the solution in a porous electrode or graphite cup, preparatory to excitation, was the technique first adopted. The detection limit for the elements chromium, nickel, copper, cobalt, vanadium, molybdenum and aluminium was found to be of the order of 0.01 per cent.

The main interest, however, was the possible application of the method to determine traces of niobium which could not be determined chemically, and also traces of titanium, zirconium and aluminium for which the best chemical procedures were complicated and time-consuming. A chemical concentration procedure was used for niobium, titanium and zirconium in which all the elements were precipitated with cupferron from a hydrochloric acid solution of 5 g. of steel. The precipitate was ignited and the mixed oxides treated with hydrofluoric and sulphuric acids to remove silica, re-ignited and the residue fused with potassium bisulphate and extracted in dilute sulphuric acid containing hydrogen peroxide. A suitable reference element was added and the solution excited. Results obtained by four members of the Sub-Committee on seven different steels, using the concentration procedure, were shown. Three members had used the impregnated electrode method, one with condensed spark and the others with intermittent arc sources, and the fourth member had used the porous cup electrode with condensed spark excitation.

Aluminium, present as alumina in the steel, could be isolated by dissolving the metal in dilute acid, filtering the residue, which contained the alumina, igniting it and fusing with sodium carbonate. The melt was then leached in dilute acid and the solution analysed spectrographically. The accuracy of determination with 5 g. samples was about ± 0.001 per cent at the 0.02 per cent alumina level. Elemental aluminium could be determined in the alumina filtrate, after a mercury cathode separation of iron and other elements, and the electrolyte concentrated by evaporation before applying the spectrographic technique.

Traces of Cobalt in Steel

Finally, Mr. Bagshawe dealt briefly with determination of individual elements by means of specific and sensitive colour reactions. One of the best and certainly the most topical example was the determination of traces of cobalt in steel. During the last two or three years this determination had assumed great importance in connection with manufacture of steels for various atomic energy power plant applications, and specification limits of <100 p.p.m. of cobalt now had to be met. This had been a very difficult problem because it had required development of specially sensitive methods which could be applied to analysis of the raw materials, iron ore, metal, ferro-alloys, etc., as well as the finished steel. The existing BS method for cobalt[2], based on the nitroso-R salt reaction, was not sufficiently sensitive in trace ranges and expedients such as increasing the sample weight were not satisfactory owing to the increased concentrations of iron, chromium, nickel and copper.

Various procedures had been recommended, e.g. the tetraphenylarsonium chloride method[3], determination as the coloured complex with β-nitroso-α-naphthol after extraction with chloroform[4]. B.I.S.R.A.[5] had recently approved a method in which iron and chromium were separated by hydrolysis with zinc oxide and cobalt precipitated with α-nitroso-β-naphthol with a little added iron to act as carrier. This served to separate the cobalt from nickel and the final determination was then made photometrically with nitroso-R salt in what was virtually a pure solution.

The excellent performance of this method was illustrated by results

obtained for steels and for ferro-alloys, nickel, chromium and other steelmaking raw materials. Smales[6] had used a radio-activation method to determine traces of cobalt in ferrous materials and a comparison of results by the two methods showed very good agreement between them.

Another determination which had given steel chemists considerable trouble in recent years was that of boron. This element was not strictly an impurity because minute amounts were deliberately added to improve depth hardening characteristics. It was estimated that as little as 0.001 per cent was sufficient for the purpose, but the general aim was to add enough to give a residual content of about 0.003 per cent. The traditional distillation and titration methods were quite insensitive at these levels and the problem had devolved on finding the most suitable colour reagent. Curcumin, quinalizarin and 1 : 1'-dianthrimide had all been tried with various degrees of success. Dianthrimide had been found the most satisfactory reagent in tests made by a BISRA Sub-Committee[7] and a recommended method had been put forward for plain and low-alloy steels. Iron and other interfering elements were first removed on an ion-exchange column and then the eluate suitably treated for development of the blue dianthrimide-boron complex.

Results obtained by the method on plain and low-alloy steels were accurate to within ±0.001 per cent boron. The performance of the method on highly alloyed steels had not been quite so satisfactory, particularly at higher levels of boron, e.g. 0.01-0.02 per cent, and work was still in progress with a view to extending the present scope of the method.

Determination of Silicon

For trace amounts of silicon, methods based on reduction of molybdisilicic acid to molybdenum blue were commonly used instead of the usual gravimetric procedures. By a judicious adjustment of the reaction conditions it was possible to work on comparatively large aliquots of the steel solution (equiv. 120 mg.) and thus obtain a very sensitive calibration over the range 0-0.05 per cent silicon. The accuracy of determination in this range was within 0.003 per cent and typical figures on low silicon 'synthetic' steels were given.

Traces of lead in steel could be very deleterious and as little as 0.01 per cent in stainless steels was said to cause hot shortness or rupture on rolling of high chromium nickel stainless steels. The determination was not an easy one and, at the levels specified, precipitation methods were not very satisfactory. Only methods employing some form of selective extraction of the lead had much hope of success. The usual procedure depended on a photometric measurement of the dithizone complex after extraction with chloroform from an ammoniacal citrate-cyanide solution. Iron in the amounts found in steel interfered but nickel interference could be eliminated, very largely, by increasing the cyanide concentration. In the present stage of development the method was acceptable for plain and simple steels; results shown were typical of performances on this class of material. Further work was necessary before the method could be applied reliably to chromium steels.

For traces of aluminium, colour methods were used based on the aurintricarboxylate reaction. This reaction had many critical features but, under rigidly coptrolled conditions, reliable results could be obtained. Most of the iron was first removed with ether and the remainder with an ether-saturated solution of cupferron. After removing the residual organic matter, the carboxylate colour was developed and measured photometrically.

Scholes and Swindell[8] had recently developed a procedure for aluminium based on reaction with Solochrome Cyanine R. The reaction was applied after a mercury cathode separation followed by sodium hydroxide to remove interfering elements. The method was applicable in the range 0.001-0.07 per cent aluminium and typical results, including comparison with the volumetric method, were given.

Traces of molybdenum could be determined very accurately by direct application of the dithiol reaction. The method was normally used on a semi-micro scale for molybdenum alloy steels, but the iron concentration had no critical influence on the molybdenum reaction and, by increasing the size of the test aliquot to the equivalent of a 200 mg. sample (normally only 15 mg. for molybdenum steels), a reaction of high sensitivity could be obtained. The reproducibility in the range 0-0.01 per cent molybdenum was well within 0.002 per cent.

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Princess Margaret Opens New Laboratories at Cambridge

PRINCESS MARGARET was received by Professor Sir Alexander Todd and Professor R. G. W. Norrish at the entrance of the new building on her arrival to declare open the new chemical laboratories at Cambridge last week.

Lord Tedder, the Chancellor of Cambridge University, in his speech of welcome, spoke of the necessity for increased accommodation particularly in the scientific research departments. He recalled the opening of new buildings for engineering and veterinary science since the war and he believed that the new chemistry laboratories, when complete, would be the best equipped chemical institute in Europe. Stressing the great importance of chemistry he described it as occupying a central position among the sciences, bridging the gap between the purely physical and the biological sciences so that it formed a necessary part of the equipment of all students of science.

Professor Norrish, seen here with Princess Margaret, has been awarded the Davy Medal (p. 813)

In her speech, Princess Margaret expressed her gratitude to the University for the great honour accorded to her in the bestowal of an honorary degree of Doctor of Law. Tracing the gradual increase of interest in the natural sciences at Cambridge, the Princess recalled a few of the famous names of the past which were associated with Cambridge; the new laboratories were a continuation of the great tradition.

Sir Alexander thanked the Princess for the honour she had done them and an inspection of the laboratories followed, during which Professor Norrish and Sir Alexander explained many of the exhibits.

British Oxygen's New Scottish Facilities for Industrial Gas

Now being erected on a 25-acre site at Polmadie, near Glasgow, for British Oxygen Gases Ltd., is a new plant capable of manufacturing several million cubic feet of high-purity oxygen and nitrogen per week. A compressing station is also being built which will be capable of meeting the increased demands for compressed oxygen, nitrogen and air in the district.

Buildings on site will include bulk storage for liquid oxygen, an electrical sub-station, propane cylinder storage dock, dispatch office and boiler house. It is proposed to distribute from the new works all industrial gases, including argon, hydrogen and propane.

British Oxygen Engineering Ltd are the architects for the new project.

New Chemistry Chair at Birmingham University

Approval has been given for the establishment at Birmingham University of a Chair of Organic Chemistry within the Department of Chemistry.

EQUIPMENT REVIEW

Chemical Plant: Laboratory Apparatus: Safety and Anti-Corrosion Products

HIGHLY STABLE CAPACITY LEVER CONTROL ORIGINAL work at the Bangor Research Laboratories of **Fielden Electronics Ltd.**, Wythenshawe, Manchester, has resulted in the new transistorised Tektor type TT5, a highly stable capacity level control. The revolutionary design of this instrument is said to give the circuit exceptional long-term stability with a very high degree of sensitivity, making it suitable for difficult applications.

Stability is stated to be of the highest order against supply variations of plus/minus 15 per cent and temperature variations up to 50°C. The 12 volt d.c. operation means the instrument is simple and inexpensive to install. As the unit can be operated off any normal 12 volt battery or accumulator it is suitable for mobile applications. Provision can be made for the unit to be operated off 230 volts a.c. through a mains converter if desired. The instrument, which is housed in a small gasketted weatherproof case, is safe to handle by unskilled personnel.

It can be used on all liquids or free-flowing solids regardless of conductivity, insulating value, density, corrosive properties or various process conditions. An extensive range of electrodes has been developed for use with this instrument to meet 'every conceivable application'.

NEW TYPE OF HEAVY DUTY COATING AFTER comprehensive field trials, **Corrosion Ltd.**, Southampton, have introduced a new and improved type of heavy-duty plastics coating under the name of Epiglo type C. This is an epoxy-based material, but of a different kind from those now widely used. It is said that it can successfully be applied under adverse conditions.

It is claimed that Epiglo type C applied to steelwork subject to severe corrosive conditions (both acid and alkaline fumes, with very high humidity) can give protection for long periods. A two-coat Epiglo type C system stood up without any sign of failure for over two years at a large chemical works. The coating was subjected to continuous spraying with water for months on end. Another test application was to the outside of ammonia tanks; ammonia spillages over the coating within 24 hours of application have had no adverse effect.

Satisfactory resistance to high concentrations of sulphuric acid at elevated temperatures is reported. A four-coat Epiglo type C system is said to have given good results in detinning plants in various parts of the country, even with high humidity, or with caustic soda fumes, present in the atmosphere for long periods.

CARBOY HANDLING EQUIPMENT CONSTRUCTION of this carboy tilter, type SCT, by **Powell and Co.**, Burry Post, South Wales, is of heavy gauge, welded steel tubing. Some of the new features incorporated are: sliding clamp does not touch the iron 'skip', but clamps down gently but firmly on the top of the glass bottle from which it is insulated by heavy-gauge rubber tubing; the tilting cradle is designed with a dropped base so that the bottom of the carboy lies within a circular retaining ring. When the carboy is in the dropped base of the cradle and the sliding clamp has been lowered into position, it is virtually impossible for it to fall, however far over it is tilted. In this position the carboy can be drained completely.

Carboy tilter in use

Model SCT/22 (for 22 in. dia. carboys) is 64 in. high (including handle), 28 in. wide and weighs 52 lb.

PNEUMATIC TEMPERATURE TRANSMITTER HIGH-purity helium is used as filling gas in the thermal system of the latest version of pneumatic temperature transmitter by **Sunvic Controls Ltd.**, 10 Essex Street, London WC2. As helium is completely inert chemically, damage to the bulb cannot affect any process, even food, and the good thermal conductivity of helium ensures rapid response to changes in temperature. The complete thermal system can be tested in a mass spectrometer, and thus even a minute leak can be detected and this, combined with the fact that the thermal system is filled at comparatively low pressure, so that volumetric changes of the bulb at high temperatures are reduced to a minimum, ensures excellent long-term stability.

In the new model 33H the thermal element can be changed without tools and thus replacement of a damaged element, or change of range, can be done *in situ*.

Wear and friction are eliminated and hysteresis and dead-spot are at a remarkably low level because no beams, links, pivots or bearings are used in construction.

Thermal systems are copper or stainless steel and bulbs are available in many forms and sizes. The instruments are made to customers' requirements and can be supplied with any range from 50°F (30°C) per instrument to 900°F (500°C) per instrument.

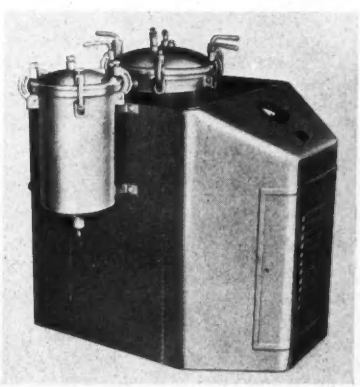
Sensitivity is of the order of 0.01 per cent of the range and very low temperatures can be measured.

CLEARWAYS FACE SHIELD THE new models of shield manufactured by **Safety Products Ltd.**, Redhill, Surrey, have headbands of lightweight fibre, supplied with a black plastics browguard and replaceable chamois sweatband which is washable. The visor is non-inflammable cellulose acetate with rigid aluminium edge binding, and is fitted inside the browguard to prevent liquids from running down inside.

DISTILLATION UNITS FOR SOLVENTS BY connecting to any steamline, saturated or superheated, and feeding the exhaust steam back to a heating system, washing plant or auxiliary machine, the running costs of a new distillation unit, marketed by **Liquid Systems Ltd.**, Norwich Union House, Wellesley Road, Croydon, Surrey, are said to be almost negligible. Known as the Schlegel DE 200 it is of simple, robust construction.

It comprises an insulated distilling chamber of 44 gall. capacity with a water-cooled condenser, and can be fitted with either a manual or automatic temperature regulator. For the removal of oils, greases, pigments and other dissolved impurities from white spirits and solvents such as turpentine, wash kerosene, nitro-solvents, trichlorethylene, etc., it is claimed to be clean to handle and simple and safe to operate.

All solvents with a boiling point under 140°C can be distilled by the use of saturated steam at 45 p.s.i.g. Liquids with a boiling point higher than 140°C



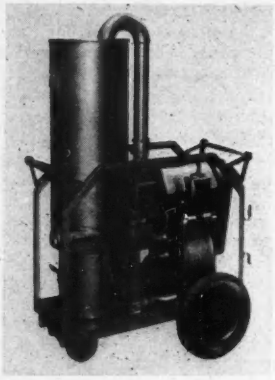
Schlegel DE 200 distillation unit

require superheated steam. The DE 200 unit is also available with electrical heating elements and automatic temperature control.

A smaller model, the Schlegel DE 30, is electrically heated and has a capacity of 6½ gall. Suitable for liquids with a boiling point ranging from 40 to 200°C, it incorporates a three-stage heating element and a thermostat which controls the heat and automatically switches off the supply when the spirit has been distilled.

INDUSTRIAL VACUUM CLEANER

BASED on the Clear-Flo design, this new industrial vacuum cleaner made by **Bivac Air Co. Ltd.**, Stockport, has been designed for heavy-duty operation. The Bivac Clear-Flo filter incorporated in it prevents recirculation of dust or toxic powders through workrooms and will



Heavy duty cleaner

restrain particles of down to 1μ diameter. Thus such materials as titanium dioxide, precipitated chalk, carbon black, starch, chrome yellow, flour etc. can be dealt with. A filter life of two years is guaranteed.

Two operators can use the machine simultaneously. Powerful suction and a large dust bin provide capacity for continuous heavy work.

PNEUMATIC TANK GAUGE

THE newly designed pneumatic specific gravity tank contents gauge of **K.D.G. Instruments Ltd.**, Manor Royal, Crawley, incorporates into one unit indicator, pressure control and all accessories including pipework. This allows for easy low-cost installation. The new instrument extends the KDG range of tank contents gauges to allow for remote reading up to distances of 1,000 ft., against the previous maximum of 350 ft.

This pneumatic indicator is available for either wall or flush panel mounting in three standard ranges: 0 to 1, 0.5 to 1.5, and 0.5 to 2.0 specific gravity. It is said to be suitable for registering the accurate blending of any liquid including corrosive chemicals. It is unaffected by temperature variations and multiples of tanks can be gauged on one indicator by using supplementary selector valves.

Other units available are a combined pneumatic tank contents and specific gravity indicator; pneumatic tank contents recorder which can be supplied with either 24-hour or seven-day mechanical or electric movements; and manual pneumatic tank contents indicators giving either 'spot' or 'continuous' reading. In the manual models an integral hand pump provides compressed air to the stand pipe assembly on the vessel or tank.

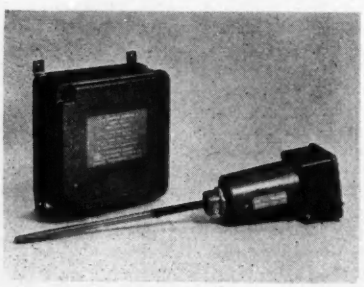
TRANSISTOR LEVEL CONTROL

THE NEW capacitance operated level control and indication equipment introduced by **Lancashire Dynamo Electronic Products Ltd.**, Rugeley, Staffs, to be known as the TLC 1 (single level) and TLC 2 (multi level), uses transistor oscillators to replace oscillator valves in the detector circuit which registers the change in capacitance at a probe or similar electrode on the approach or recession of a material. In the transistor oscillator circuit, the external capacitance represented by probe and earth is connected to the tuned circuit of the oscillator.

With the high level probe unit, oscillation occurs when the probe is clear of the material and under these conditions the relay in the control unit is energised. With the low level probe head unit, the system operates in reverse, the relay in the control unit being energised when the probe is completely immersed.

Several important improvements in design and performance have been realised due to the use of transistors: The entire level detector circuit is housed within the probe head casting; the remote control unit can be mounted any distance away from the probe head unit, with only three interconnecting wires; all wiring external to the remote control unit is at a maximum potential of 12 volts d.c. to earth; maximum current which can be drawn in the connecting cables under short circuit conditions is 50 m.amp. d.c.

The equipment is integrated with a common form of probe head which will accept the various electrode assemblies. Maintenance is facilitated by the use of printed circuit units, arranged to drop into the diecast exterior casing, a single point contact being automatically made at the probe end of the circuit by means of a spring loaded device.



TLC 1 control unit and probe head with normal duty probe

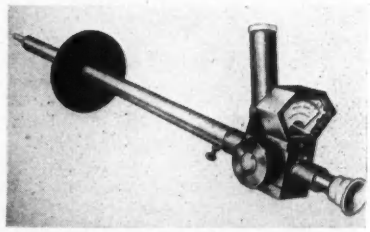
The probes are: normal duty, for small granulated solids and chemically inert liquids (12 in. long, ¼ in. dia. of stainless steel); heavy duty, for heavy materials where probe may be subjected to considerable impact (6 in. long, 2½ in. dia. also of stainless steel); angled probe, for powders where 'build-up' would occur on a normal duty horizontal probe —the angled probe has an insulated glazed ceramic sheath; suspension probe, for vertical suspension above container.

SINGLE-PAN LABORATORY BALANCE

LOAD capacity up to 600 g. with automatic weight-placing mechanism is one of the features of a new laboratory balance made by **Mikrowa**, Switzerland, and distributed here by **Optical-Mechanical (Instruments) Ltd.**, 17, Station Road, Egham, Surrey. Grouping of all scales and controls on the front makes for convenient operation and curved sliding doors afford free access to the weighing pan from the front. Weighing pan is 150 mm. in diameter which means fairly large vessels can be accommodated. The built-in transformer operates on 110, 125, 145 and 220 volts a.c. Accuracy claimed is ±1 mg. and reproducibility of results ± 0.5 mg.

OPTICAL IMMERSION PYROMETER

ACCURATE readings can be obtained in a few seconds using the new Foster-Platt optical immersion pyrometer marketed by Foster Instrument Co. Ltd., Letchworth, Herts, it is claimed. The instrument is



Foster-Platt immersion pyrometer, by Foster Instrument Co.

said to open up an entirely new approach to the temperature measurement of molten metals in crucibles and ladles. The optical axis of a disappearing filament type of optical pyrometer is extended in a light-tight tube sealed at its outer end with a refractory sheath. Since the image of the pyrometer filament is permanently superimposed, a reading can be taken very quickly. In most non-ferrous metals the refractory sheath will withstand up to 150 immersions and 50 in cast iron.

Should the sheath break, a new one can be fitted quickly and cheaply. The instrument is completely self-contained, having dry batteries with special high-current cells in the tubular handle.

Overseas News

BIG INCREASES IN WEST GERMANY'S OUTPUT AND EXPORTS OF PHARMACEUTICALS

PHARMACOLOGICAL and therapeutic products manufactured in West Germany during the first half of this year totalled a value of DM854 million (about £71¼ million) as compared with DM752 million (about £62¾ million) during the same period of 1957. Of this total, pharmaceutical products accounted for a value of DM568¼ million (£47½ million) in the 1958 half-yearly period, as against DM467.7 million (approx. £39 million) last year.

In the half-year period Germany's exports of pharmaceutical products reached the new record of DM231.2 million (about £19¼ million), an increase of about DM40 million (some £3.3 million), or 18.4 per cent. A particular increase was noticed in foreign sales of semi-manufactured pharmaceutical products, which, the West German Association of the Chemical Industry says, are finished off and packaged to be sold as domestic in importing countries in an increasing number of cases. Sales in this field rose by nearly 33 per cent on the 1957 figure to a total of DM78.3 million (approx. £6½ million); exports of prepared products increased by 14 per cent on last year's totals.

Imports into West Germany also rose considerably in the period. In the first six months of this year they were 13.6 per cent up on those during the first half of 1957, reaching a total value of DM70 million (about £5¾ million). Of these imports, 70 per cent were semi-manufactured goods which were finished and packed in Federal Germany, mainly on the premises of foreign companies or their subsidiaries. A total of 71 per cent of all imports come from countries within the planned free trade area.

Luxembourg Phenol Plant to Close

One of Europe's largest synthetic phenol plants, that of the Belgian SA Cockerill-Ougrée chemical and steel concern in Luxembourg, is to be closed. Annual capacity of the plant is 10,000 metric tons, most of which is exported to Federal Germany, where prices are 15 per cent lower than in UK, France and US and the closure is said to be mainly due to the low price. West Germany is, after US, the largest producer of phenol in the world and the demand there is now covered by home supplies.

India's Expanding Pharmaceutical Industry

As part of India's drive to expand its pharmaceutical industry, Khandelwal Laboratories, Bombay pharmaceutical producers, have come to an agreement with the West German Asta-Werken concern by which it will produce the German company's patent commodities. In another project, a Russian team of experts is studying the setting-up of two plants in Kashmir for the production of antibiotics in which the Russian government is prepared to invest 80 million roubles and aid operation. Johnson and Johnson (US) are already building a pharmaceutical plant at a cost of 380,000 dollars.

Protest Against Isotope Laboratories at Göttingen

Following the announcement in Göttingen that several of the University's science faculties are to be equipped with isotope laboratories, a public protest has been made. Even if the chances of an accident are slight, the complaint is that the risk is too great to be taken because the site borders 15 house properties and is close to a children's home, a school and a main road.

Simplified Manufacture of Hydrochloric Acid

Absorption of gases containing hydrogen chloride by means of an adiabatic absorption process has greatly simplified the manufacture of hydrochloric acid in BASF. The process has been technically worked out to perfection by the use of suitable working materials and special filters. It is claimed that gases of any kind containing hydrogen chloride can be processed to hydrochloric acid. Within a short time 60 plants have been established all over Western Europe.

Chemical Products from Acetylene in Texas

Dow Chemical Co. and an affiliated company of BASF have founded jointly an American joint stock company, Dow-Badische Chemical Corporation, which is building a plant in Texas for the manufacture of chemical products from acetylene. The new company has a capital of 6 million dollars. High-pressure processing of acetylene. 'Reppe method', as developed by BASF, will be used in the plant.

Dialysis System for Acids

Development of a dialysis system for acid as well as general chemical separation is reported by the Graver water conditioning division of Union Tank Car, US. Recovery of 90 per cent of acid at efficient operating rates and with small amounts of impurities is reported.

Homogeneous vinyl membranes are used in the dialysis equipment. The unit is described as having a filterpress type design and is composed of alternate solution- and water-cells in upright frames. Each cell is separated by the semipermeable vinyl membranes. Frames are usually composed of acrylic plastics, although steel has also been used. Ports in the frames are adjacent to each other in the press and act as conduits for the counterflowing solution and water feeds, which enter the unit by gravity.

The vinyl membrane, it is claimed, will have a life of two years. High diffusion rates (up to ¼ lb. of sulphuric acid per sq. ft. per hr.) are stated to have been obtained with strong acid. This would mean that more than 400 lb. of sulphuric acid could be recovered per hour in a large unit (800 to 850 sq. ft.). For caustic separation a standard parchment membrane is used, although a cellulose type membrane can be used in some non-acid designs.

Electric Reduction's Output of Sodium Chlorate Doubled

Expansion of facilities for the production of sodium chlorate has just been completed at the plant of Electric Reduction Co., at Buckingham, Quebec. Capacity for chlorate production has been doubled and combined with the company's chlorate production at its Vancouver plant makes Electric Reduction the world's largest producer of this chemical.

High Temperatures from Chemical Reactions

Study has shown that the most critical quantity limiting high temperatures in flames is bond energy. A survey of diatomic species, reported by D. Altman, California Institute of Technology for Ordnance Corps, US Army (PB 131549, OTS, US Department of Commerce, Washington 25, D.C.), indicates that the N-N bond and the C-O bond are the two most energetic known and chemical reactions which form only these two species can give the highest temperatures attainable solely by chemical means.

New Dutch Carbon Black Plant will Use US Processes

The Dutch chemical manufacturers who specialise in the production of sulphuric acid and allied commodities, Koniklijke Zwavelzuurfabrieken v/h Ketjen NV, Amsterdam, are to erect a plant for the manufacture of carbon black at Rotterdam. A new company, by the name of Ketjen Carbon NV, will be set up by the Zwavelzuurfabrieken concern, who will hold the majority interest in it, to operate the plant. Technical advice and the use of patented processes will be granted by Godfrey L. Cabot Inc., US, the world's largest producer of carbon black. The plant, for which a total investment of 13 million guilders (about £1.3 million) will be necessary, will have an initial capacity of 13,000 metric tons of high quality oil furnace blacks annually, almost all of which will go to the rubber industry. No date for the completion of the plant has yet been announced.

NEW TI SOLDER IS AMONG INVENTIONS NOW AVAILABLE UNDER NRDC LICENCE

AFTER discouraging results from tests using unalloyed silver as a solder for titanium alloy and an alloyed aluminium as a solder for others, H. C. Davis, of the Ministry of Supply, R.A.E. has published in the NRDC Bulletin, October 1958, No. 13, under Pat. Appln. No. 9090/57 results of his tests of a new solder alloy. This contains up to 85 per cent silver with either aluminium alone or mainly aluminium with small proportions of one or more of the strengthening elements titanium, nickel, copper, manganese or silicon.

The solders containing nickel and manganese have the special advantage of relatively high ductility, so that failure in a soldered joint tends to be localised and does not lead to complete failure of the joint. In general, the new solders have good wetting and flow properties and this enables joints of consistent quality to be made.

Also listed in the NRDC Bulletin were the following:

Primary Cell using Deposited Cathode: Very low internal resistance is obtained in primary cells by forming the cathode and a separating layer on the surface of the anode. As a result, a high generated current in relation to the space occupied by the cell is produced. The separator is of molecular thickness. [744978]

Pipe Coupling: A bayonet joint for connecting two identical halves of a pipe coupling for corrosive fluid, each half being fitted with self-sealing mushroom type valves. [3602/56]

Cell Holder: This invention relates to a cell holder for use with a spectrophotometer, especially for the temperature control of the holder. [B.P. 779309]

Manometer: An improved fluid manometer for the precise measurement of small variations in pressure. [735320]

Temperature-controlled Heating: A heating member can, with this invention, be automatically controlled so that its temperature fluctuates within only very small limits. [2705/54]

Anti-cholinesterase Inhibitors: Quaternised pyridine aldoxime hydrocarbon sulphonates are effective antidotes to organo-phosphorus compounds. A mixture of aldoxime and atropine is more effective than either alone. Atropine-oxime sulphonate mixture can be effectively administered to human beings intramuscularly and orally. [27902/57]

Semi-Permeable Membranes: A process for making a series of membranes of graded porosity for use in dialysis to recover caustic soda and in fractionation of polymers in solution. [27681/54]

Perfluorocarbons: Fluorination of fluorohydrocarbons results in stable non-inflammable liquids which are possible lubricants, hydraulic fluids or dielectrics. [735104]

Fluorinated Ketals and Acetals: These may be made by reacting fluorinated ketones and aldehydes with hydroxy compounds, e.g. trifluoroacetone with mannitol. [748413]

Condensation Products of Fluoroketones: Treatment of trifluoroacetone and similar fluoro-ketones with alkaline reagents yields condensation compounds which could possibly be used as insecticides, growth-inhibiting agents or chelating compounds for certain metals. [773402]

Graft Polymers: A cationic catalysis method for making graft polymers consists of using polymers containing chlorine or bromine attached to an aliphatic carbon atom in the presence of a Friedel-Crafts catalyst to initiate the polymerisation of olefins, and to alkylate aromatics. [31652/55]

Polyurethane Mixing Machine: A small machine for mixing polyurethane foams, developed at R.A.E., and particularly suitable for *in situ* foaming. [36846/56]

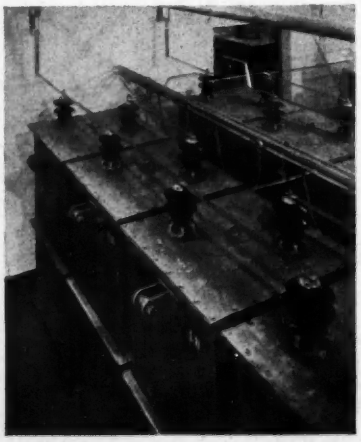
Liquid Absorption of Gases by Foam: For total foaming of liquids without the addition of surface-active agents and the method is particularly applicable to processes where liquids are to be acted on by gases, e.g. in scrubbing towers.

Capacitor Bank at DCL Works Will Save £30,000 a Year

THE calcium carbide works of the Distillers Co. Ltd., at Kenfig Hill, Margam, South Wales, is now equipped with the largest industrial shunt-connected capacitor bank in the U.K. This recently completed installation was essential to avoid the penalty imposed by the South Wales Electricity Board when the average monthly power factor falls below 0.95 lagging. The 18,000 kVAr capacitor bank raises the average monthly power factor above the required limit and it is estimated that a £30,000 annual saving will result.

British Insulated Callender's Cables Ltd. manufactured the 72-250 kVAr tank-type capacitors comprising the bank, which were subsequently installed by British Insulated Callender's Construction Company Ltd.

The main load of the factory is derived from the three calcium carbide electric arc furnaces, and the capacitors are connected as near as possible to the furnace transformer primary busbars.



Interior of the DCL capacitor house showing ducting for the ventilating system above some of the BICC capacitors

Two 10 MVA 33/11 kV transformers, which supply the auxiliary load of the factory, are connected to these busbars via 33 kV oil circuit breakers. A capacitor bank is connected to the secondary side of each transformer and the circuit breakers are used to switch each section. The breakers were uprated to 750 MVA breaking capacity as an added precaution.

A specially designed building houses the capacitors, which are arranged in three bays, with an additional bay should a fourth furnace be installed at a later date. Because of atmospheric conditions the plant had to be pressurised with elaborate provision for temperature control and ventilation.

ICI Dyestuffs Division Polyurethane Developments

ONE outstanding feature common to Daltogen 50, a new catalyst for polyurethane surface coatings, and Daltolac 24 is their lack of odour.

Daltogen 50 has been primarily developed for use with Daltolac 9, 10 and 11 lacquers cured with Suprasec K, and improves still further the already fast curing rate. Except when twin-feed spray equipment is used the working life is still at least one hour. It is a liquid with flash point 140°F and is strongly basic. Normal handling precautions against contact with the skin and eyes are necessary.

Introduction of Daltolac 24 into polyurethane foams extends the range of densities which can be achieved by foaming *in situ* techniques using the two-component polyurethane system, the organic isocyanate, Suprasec D, being the other component in each case. Daltolac 24 contains a reaction catalyst and other additives so that when 100 parts are reacted with 130 parts of Suprasec D, fine-textured rigid foams of 1.8 to 2.0 lb./cu. ft. densities are obtained.

PEOPLE in the news

● PROFESSOR R. G. W. NORRISH, F.R.S., professor of physical chemistry in the University of Cambridge has been awarded the Davy Medal by the Royal Society for his work in chemical kinetics, especially in photochemistry. This week in Paris he received an honorary degree (*Docteur Honoris Causa*) at the Sorbonne. His recent papers include 'Flash photolysis—studies of knock and antiknock by kinetic spectroscopy' and 'Some isothermal reactions of free radicals studied by kinetic spectroscopy.' His latest paper which is due to be published shortly, is 'Absorption spectrum of SO and the flash photolysis of sulphur dioxide and sulphur trioxide.'

● DR. H. A. THOMAS, who has recently been appointed chairman of the Paper and Textile Chemicals Group of SCI, has been with Courtaulds Ltd. for 20 years, during which he has taken a leading part in initiating new departments and activities. His Ph.D. degree was obtained at Birmingham University where he worked on carbohydrates, cellulose and its derivatives with Professor E. L. Hirst.

He joined Courtaulds from ICI where he had established the applied research section of the dyehouse department, and after some years as manager of Courtaulds' yarn dyehouse and research laboratory at Droylsden he became

Dr. H. A. Thomas, chairman of the new SCI group

chairman of the International Rayon and Synthetic Fibres Technological Committee on its inception in 1949. Recently, as a result of the Courtaulds/Celanese merger, he has been appointed marketing manager (technical) of the marketing division.

Outside his business activities he has always taken a keen interest in the affairs of the scientific societies and in view of his long association with both the chemical and textile industries, it is appropriate that he should be elected the first chairman of the SCI Paper and Textile Chemicals Group.

● MR. K. M. N. FERGUSSON has been appointed an ordinary director of Evans Medical Supplies Ltd.

● SIR THOMAS MERTON, K.B.E., F.R.S., formerly professor of spectroscopy at Oxford University, has been awarded the Rumford Medal for his researches in spectroscopy and optics. An extensive programme of research by the National Physical Laboratory was based on a suggestion of Sir Thomas' for the production of diffraction gratings, and important results have already been achieved. These diffraction gratings have applications in infra-red spectroscopy and from the engineering point of view, in machine-tool control.

● MR. D. F. WARD has recently been appointed to the board of directors of Barlow-Whitney, Ltd., London and Bletchley. After an engineering apprenticeship with British Thomson-Houston, at Rugby, he held appointments in the research laboratory and in the special valve manufacturing department before joining Barlow-Whitney in 1946 as technical buyer. For the last three years Mr. Ward has been manager of the company's Neasden factory.

● DR. M. H. CARDEW, Ph.D., and DR. M. B. KING, Ph.D., have been appointed lecturers in chemical engineering at Birmingham University.

● PROFESSOR LOUIS A. JORDAN, director of the Paint Research Station, Teddington, and professor of chemistry at the Royal Academy of Arts, is to be one of the judges for the best 1958 papers based on original research in tall oil. This contest is held annually by the Tall Oil Products Division of the US Pulp Chemicals Association.

● MR. H. C. S. DE WHALLEY who retired a year ago from his position of director of research, Tate and Lyle Research Laboratories, Keston, Kent, was re-elected president of the International Commission for Uniform Methods of Sugar Analysis at the 12th session held in Washington DC, US. He has since been appointed as co-ordinator of European research projects of the Sugar Research Foundation, New York.

● PROF. ULRICH HABERLAND has been re-elected president of the Association of West German Chemical Industry.

● MAJ.-GEN. E. P. READMAN and MISS V. A. PEASE have joined the board of Amber Chemical Industries Ltd.

● Among the passengers who sailed from Southampton to New York in the *Queen Mary* on 6 November, was SIR DANIEL FENNELLY, general manager of the National Sulphuric Acid Association, London.

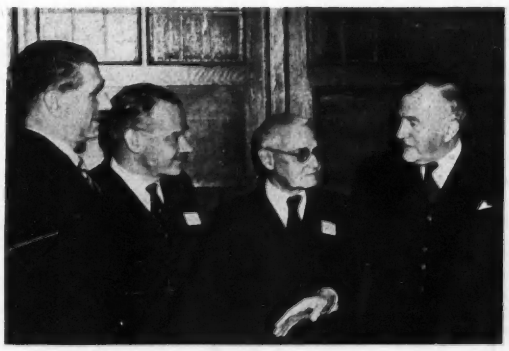
● MR. M. H. M. ARNOLD has been appointed managing director of Bowmans Chemicals Ltd., Widnes, in succession to MR. S. H. W. PERT who has retired after 32 years' service with the company.

● MR. H. HODGSON has been appointed comptroller of Fisons Ltd., to fill the vacancy caused by the death of Mr. J. Burgess.

● MR. MONTAGUE MILLER, F.C.S., M.S.R., has been appointed by Leda Chemicals Ltd., PO Box 500, Berk House, Portman Square, London W1 (a subsidiary of F. W. Berk and Co.) to co-ordinate the sales and development of the Pharmaceutical Division. Mr. Miller has served with other pharmaceutical companies, and was instrumental in marketing new products of the anti-hypersensitive, antibiotic and hormone groups of drugs.

● MR. T. I. WILLIAMS has been appointed managing director of Harshaw Chemicals Ltd., Waltham Cross, Herts, in succession to MR. A. C. BENNING, who has returned to the US. Mr. Benning retains his seat on the board.

● MR. R. A. MILLAR CRAIG has been appointed general works manager for the factory which is now under construction by Carbide Industries Ltd. at Maydown, Londonderry. Mr. Millar Craig will take up residence in Londonderry early next year.



At the Manchester conference on fuel and power in British industry, l. to r., H. Cunliffe, general manager, industrial fuels, Shell Mex and BP; Professor Frank Morton, chemical engineering department, Manchester University; Professor F. C. Thompson, conference chairman and chairman, Manchester Joint Research Council; and Lord Mills, Minister of Power

Commercial News

- **Fisons Sales £2·65 million up**
- **No Ordinary Dividend from United Indigo**
- **Simon-Carves acquire Lodge-Cottrell**
- **US Borax omit Dividend Payment**

Fisons Ltd.

Total sales of Fisons Ltd. rose from £44,750,000 to £47,391,000 in the year ended 30 June 1958. Group net profit was £1,594,970 compared with £1,516,413. A rise from £2,162,249 to £2,552,492 in interests in associated companies reflects investment of further capital in Fisons (Pty) of South Africa.

Dividend is maintained at 15 per cent with the 10 per cent final on the capital increased by a one-for-three capital rights issue.

Group capital expenditure amounting to about £3,030,000 (£6,035,000) has been authorised. Commitments under contracts for capital expenditure total £1,490,000 (£2,241,000).

Although the principal interest remains in the fertiliser industry, the company reports that it has steadily increased its activities in the chemical field. In the first quarter of the current year sales reached an all-time record by a large margin. Turnover of Fisons Chemicals (Export) again showed a substantial increase, particularly in dollar account countries where it has risen nearly tenfold to almost £500,000 a year. (See also p. 803.)

Savory and Moore

Group trading profits for Savory and Moore after deducting a loss are £198,932 (£184,388). Minority holders and taxation took £114,388 (£103,338). Net profit (after deducting loss) is £84,544 (£81,050).

A dividend of 15 per cent to 31 March 1958 is recommended (same).

Simon-Carves

The offer by Simon-Carves Ltd. to acquire the whole of the issued capital of Lodge-Cottrell has now been accepted by the holders of more than 90 per cent and has become unconditional.

United Indigo

No ordinary dividend is being paid by the United Indigo and Chemical Co. for the year ended 30 June 1958, against the 5 per cent previously. The preference dividend has already been paid. A group loss of £5,639 was incurred against a previous profit of £2,526, after tax of £332 (£962).

Inco of Canada

Net earnings of the International Nickel Co. of Canada Ltd., and subsidiaries for the first nine months of 1958 are US $30.3 million ($66.0 million for the same period in 1957). The third quarter's contribution to net earnings of $8.9 million is under the second quarters $9.2 million and well below the figure of $20.4 million in the same period last year.

Commenting on factors affecting the nine months' result, the chairman, Dr. John F. Thompson, said that nickel deliveries during the period were down 33 per cent from the same period in 1957. Copper prices and platinum metals deliveries and prices, were also down substantially. Intake from sales was therefore $83 million less.

Dividends for the year total $2.60 per share against $3.75 for each of the three preceding years.

Yorkshire Tar

After tax of £244,559 (£178,535) group net profit of Yorkshire Tar Corporation, for the year ended 30 June 1958, is £67,080 (£80,596). A special receipt trade dividend is £136,941 net (nil). Ordinary dividend is nil (£14,375 —12½ per cent). A capital dividend of £100,000, not included above, was paid in January this year.

US Borax and Chemical

In order to 'conserve cash resources in present circumstances', United States Borax and Chemical Corporation, the US operating company of Borax (Holdings) are omitting a common stock dividend payment. The directors of Borax (Holdings) state that this decision, which is in respect of the year beginning 1 October 1958, does not affect the results of Borax (Holdings) for the year ended 30 September last. It is pointed out that the fact that US Borax is omitting to pay a dividend need not affect the distributions to be made by Borax (Holdings), as the consolidated profits of the group are taken into account in determining the dividends of Borax (Holdings). When the US company was formed, it was decided that any dividends received by US Borax would be retained for the time being in the US.

The need for strengthening the cash resources of US Borax, it is stated, arises from the unsatisfactory situation of the potash business resulting from the materially lower prices which took effect on 1 July 1958. Also, last year's heavy start-up expenses at Boron affected earnings adversely and involved substantial drains on cash. The Boron operations have shown improvement which is expected to continue.

INCREASE OF CAPITAL

HARDINGS (PENDLETON) LTD., chemicals, etc., 22 Booth Street, Manchester 2. Increased by £10,000 beyond the registered capital of £1,000.

Market Reports

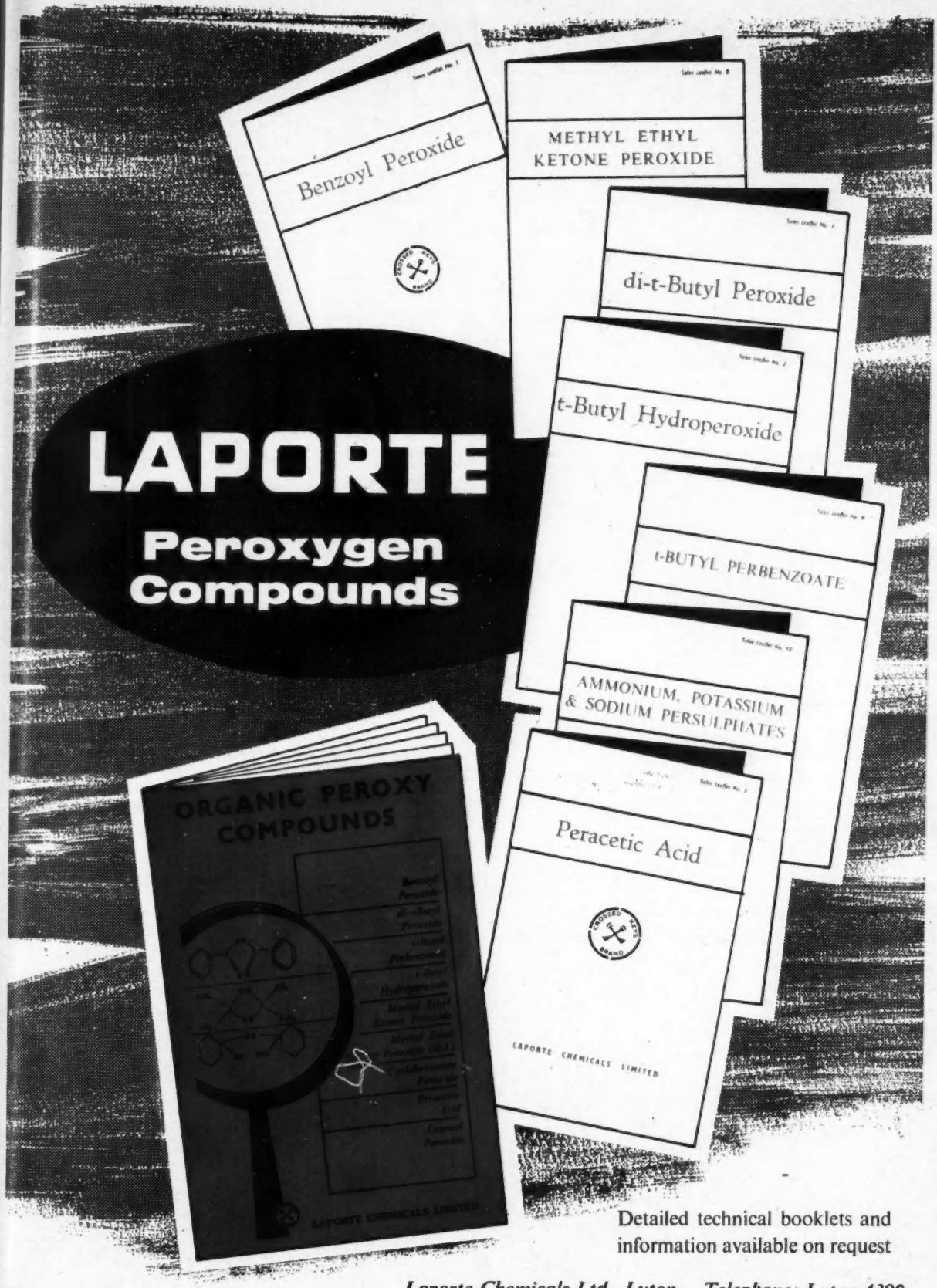
LITTLE CHANGE IN CHEMICAL PRICES

LONDON Conditions on the industrial chemicals market are unchanged on the week and prices generally remain firm. The movement of supplies against contracts continues to cover good quantities and there has been a steady flow of new inquiry both for home account and for shipment. The zinc oxides have further advanced with the higher cost of the metal.

Pitch is in good request from home users and there has been a steady call for creosote oil, cresylic acid and phenol and prices generally on the coal tar products market remain steady.

MANCHESTER Traders on the Manchester chemical market have experienced a steady flow of delivery specifications against contracts for caustic soda and other soda compounds, as well as for the potash and ammonia products. Replacement business on home-trade account has been moderate, while exports continue on a fair scale. There has been little change in prices of heavy chemicals generally. Fertilisers are moving in fair quantities so far as basic slag and compound types are concerned, with a steady demand for tar products.

GLASGOW With a background of fairly steady and unchanged prices, except perhaps of metal derivatives, the trading position during the past week in the Scottish heavy chemical market showed a little more activity. Contract requirements were fairly well taken up, while demands for spot deliveries, although not showing much increase, were up to normal quantities. The range of chemicals was varied, including caustics, acids, formaldehyde, etc. In regard to exports, little change has taken place, with the market reasonably steady, and here again there is room for improvement.



Detailed technical booklets and information available on request

Laporte Chemicals Ltd., Luton. Telephone: Luton 4390

NEW PATENTS

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Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATION

On Sale 17 December

Hydrogenation of petroleum residues. Anglo-Iranian Oil Co. Ltd., & ors. 721 302

ACCEPTANCES

Open to public inspection 23 December

Fluorescent materials. Siemens Edison Swan Ltd. 806 191

Extraction of plutonium. UK Atomic Energy Authority. 806 202

Detergent compositions. Scottish Oils Ltd., Stewart, D., and Silsby, G. C. 806 241

Measurement of the rate of flow of fluids. Controle de Chauffe. 806 442

Fireproofing product resistant to high temperature and process for manufacture. Bertrand, M. L. 806 437

Film forming pesticidal compositions based on aminoplastic and oil-modified alkyd resins. Insecta Laboratories Ltd. 806 261

Production of electrolytic metal coatings. Dehydag Deutsche Hydrierwerke G.m.b.H. 806 403

Process for operating converter plant. Waagner-Biro AG, and Vereinigte Osterreichische Eisen- und Stahlwerke AG. 806 404

Neutron detectors. General Electric Co. 806 306

Selective weedkillers. Union Chimique Belge S.A. 806 243

Glass furnaces. Jerome & Bonnefoy & Cie. 806 262

Coating of mild steel. Tickle, W. H. F. 806 405

Cleaning of sand for foundry cores and moulds. Birmidal Developments Ltd. 806 244

Process for setting polyamide textiles. Institut für Textiltechnologie Der Chemiefasern. 806 264

Hardening of epoxy resins. Pressed Steel Co. Ltd. [Cognate application 34264.] 806 195

Semiconductor devices. General Electric Co. 806 505

Cross-flow heat-exchangers. Henschel & Sohn G.m.b.H. 806 343

Containers for fluids. Parkinson & Cowan Ltd. 806 478

Process for and composition for inhibiting metallic corrosion. Soc. De Produits Chimiques, Industriels et Organiques, Prochinor. 806 410

Catalytic removal of organic sulphur compounds from town gas or other fuel gases. Maxted, E. B. 806 411

Treatment of distilled water. Sutcliffe Speakman & Co. Ltd. 806 445

Fabricating method. Imperial Chemical Industries Ltd. [Addition to 766 813.] 806 344

Low temperature properties of middle distillate petroleum fuel oils. Esso Research & Engineering Co. 806 245

Fibrous body bonded to a metallic sheet. Owens-Corning Fibreglas Corporation. 806 209

Apparatus for regulating the flow of a fluid through a passage. Curtiss-Wright Corporation. 806 345

Preparation of flexible cellular materials. Goodyear Tire & Rubber Co. 806 483

Temperature control systems. Rheostatic Co. Ltd. 806 171

Anthrone derivatives. Imperial Chemical Industries Ltd. 806 384

Methods for agglomerating vulcanisation accelerators. Goodyear Tire & Rubber Co. 806 413

Cold working of metal. American Radiator & Standard Sanitary Corp. 806 387

Compositions for vegetative propagation of plants. Wisconsin Alumni Research Foundation Corp. 806 246

Plasticisation of perfluorochloro-olefins. Minnesota Mining & Manufacturing Co. 806 268

Epoxy resin composition. Distillers Co. Ltd. 806 196

Bonding rubber to metal. Lord Manufacturing Co. 806 449

Bonding rubber to substrates. Lord Manufacturing Co. 806 450

Insulating oil compositions. British Petroleum Co. Ltd. 806 292

Stabilising organic compounds subject to oxidative deterioration. Universal Oil Products Co. 806 211

Dyeing of textile materials. Courtaulds Ltd. 806 250

Manufacture of semi-conductor devices. General Electric Co. Ltd. 806 251

Production of esters of unsaturated acids. Distillers Co. Ltd. 806 197

Production of dyestuffs of the phthalocyanine series. Badische Anilin- & Soda-Fabrik AG. 806 175

Continuous production of poly-amides from dicarboxylic acids and diamines or amino-carboxylic acids. Vereinigte Glanzstoff-Fabriken AG. 806 252

Heating gases and vapours to high temperatures. Union Rheinische Braunkohlen Kraftstoff AG. 806 348

Conversion of polyethylene terephthalate into dimethyl terephthalate. Vereinigte Glanzstoff-Fabriken AG. 806 269

Organo-silanes. Pierce Foundation, J. B. 806 415

Production of half-ethers of cyclo-aliphatic glycols. Badische Anilin- & Soda-Fabrik AG. 806 297

Mono-azo dyestuffs of the benzene-azo-benzene series. Imperial Chemical Industries Ltd. 806 271

Making latent foaming thermoplastic resin compositions. Dow Chemical Co. 806 298

Process and apparatus for the degasification of solid fuel. Stamicarbon N.V. 806 255

Synthetic polymer compositions. Esso Research & Engineering Co. 806 198

Fluorescent materials. Siemens Edison Swan Ltd. [Divided out of 806 191.] 806 192

Vanadium-zirconium pigments. Harshaw Chemical Co. 806 480

Method of embedding particles in plastic sheet material. Goodyear Tire & Rubber Co. 806 217

Regenerating and recirculating systems for solid/liquid suspensions, in mineral dressing and other plant. Stamicarbon N.V. 806 394

Fire-proof and heat insulating coating compositions. Bertrand, M. L. [Divided out of 806 437.] 806 438

Waterproofing building materials. Monsanto Chemicals Ltd. 806 226

Production of refractory metals. Du Pont De Nemours & Co., E. I. 806 272

Purification of N-vinylcarbazole. British Oxygen Co. Ltd. 806 491

Incorporating carbon black and other compounding ingredients in rubber. Marco Co. Inc. 806 362

Production of liquid phenolic condensation products. Monsanto Chemical Co. 806 273

Production of aromatic nitriles and imides. Distillers Co. Ltd. 806 492

Preparation of carbazole. British Oxygen Co. Ltd. 806 493

Liquid and vapour separating centrifugal pump. Lear, Inc. 806 419

Baths for and process of electroless nickel plating. General Motors Corp. 806 494

Heat economy in aromatic hydrocarbon solvent extraction processes. Universal Oil Products Co. 806 421

Process for bonding polychlorotrifluoroethylene. Du Pont De Nemours & Co., E. I. 806 422

Preparation of organic monochloro derivatives Hardman & Holden Ltd., and Rinse, J. 806 182

Members prepared from cobalt base alloys. Westinghouse Electric International Co. 806 183

Producing spheroidal alumina particles. Universal Oil Products Co. 806 199

Preparation of cold-water-soluble forms of cellulose ethers. Dow Chemical Co. 806 200

Hardening of steel objects. Du Pont de Nemours & Co., E. I. 806 426

Substituted urea compounds and process for producing same. Parke, Davis & Co. 806 338

Cemented carbides. Ford Motor Co. Ltd. 806 496

Salicylic acid 2, 6-dimethyl-4-*n*-propoxybenzoate. Upjohn Co. 806 499

Preparation of cytosine and intermediates. Kay-Fries Chemicals, Inc. 806 235

Method and apparatus for dissolving sugar and like crystalline substances Amalgamated Sugar Co. 806 378

Hydrogenation of saccharides. Engelhard Industries, Inc., formerly Baker & Co., Inc. 806 236

Epoxy polymerisable and polymerised compositions and a process for their preparation. Union Carbide Corporation. 806 447

Explosive pellets. Du Pont De Nemours & Co., E. I. 806 278

Detergent compositions. Hedley & Co. Ltd., T. 806 340

O-aryl o-lower-alkyl N-alkenyl phosphoroamidothioates. Dow Chemical Co. 806 280

Insecticidal compounds and process for their production. Norddeutsche Affinerie, Spiess, P., and Spiess, W. [trading as Spiess & Sohn, C. F.] 806 238

Production of titanium. New Jersey Zinc Co. 806 470

Purification of polyalkylphenols. Trubek Laboratories. 806 239

Monofluoroacetylene and polymers thereof. Du Pont De Nemours & Co., E. I. 806 240

Hardenable compositions comprising epoxy resin, and a process for curing these compositions. Bataafsche Petroleum Maatschappij N.V., De. 806 188 & 806 259

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection 31 December

Production of uranium and apparatus therefor. Imperial Chemical Industries Ltd., Lofthouse, E., and Collins, J. H. 806 739

Method of preparing uranium hydride. Newton, A. S. 806 731

Preparation of compounds of uranium and non-metals. Newton, A. S. 806 732

Propellant fuel. California Research Corp. 806 870

Manufacture of aqueous suspensions of pesticidal substances. Murphy Chemical Co., Ltd., Chambers, V. H., and Lloyd, D. E. 806 695

Manufacture of terephthalic acid and potassium salt thereof. British Celanese Ltd. 806 632

Manufacture of salts of sulphuric acid esters of leuco vat dyestuffs of the anthraquinone series. Durand & Huguenin AG. 806 634

14-Dehydro steroids and their production. Ciba Ltd. 806 743

Processes for fusing powdered semi-conductor materials. Siemens & Halske AG. 806 697

Lubricating oil detergent. Continental Oil Co. 806 595

Apparatus for the removal of water from sewage sludge by evaporation and drying. Siekierski, M. W. 806 699

Aminopyridazone-(6)-compounds. Ciba Ltd. 806 635

Alkaloids. Sorelux, S. A. 806 691

Pigmented oil-in-water resin emulsions. Geigy, J. R., S.A. 806 571

Organic derivatives of phosphoric acid. Farbenfabriken Bayer AG. 806 638

Production of azo dyestuffs devised from 2, 3-hydroxynaphthoic acid. Badische Anilin- & Soda-Fabrik AG. 806 721

Fire-extinguishing agents. Kerr & Co. (Manchester), Ltd., J. 806 642

Hydrometer. Fung, M. 806 748

Pharmaceutical compositions. Imperial Chemical Industries Ltd. 806 722 & 806 723

Derivatives of thiophenylpyridylamine and their production. Deutsche Gold- Und Silber-Scheideanstalt Vorm Roessler. 806 531

Organophilic hydrophobic silicas. General Electric Co. 806 604

Cooling equipment. British Thomson-Houston Co. Ltd. 806 786

Double-skeleton material particularly suitable for use as an electrode in a fuel cell. Ruhrchemie AG, and Steinkohlenelektrizitaets AG. 806 644

Production of a high plasma density in the anode region of a low-pressure gas discharge. Veb Vakutronik. 806 787

Ethylene polymerisation. Imperial Chemical Industries Ltd. 806 649

Liquid organo-silicon polymers as lubricants. General Electric Co. 806 724

Producing bright surfaces on aluminium and aluminium alloys. Vereinigte Aluminium-Werke A.S. 806 608

Fractionating of suphite lye. Toten Cellulosefabrik AG. 806 652

Fuel cells. National Research Development Corp. 806 591

TRADE NOTES

Aluminium Oxides

Prices for aluminium oxides supplied by Woelm and available in UK from L. Light and Co. Ltd., Poyle Estate, Colnbrook, Bucks, have been reduced and a new booklet 'Chromatography on aluminium oxides' has been published showing several uses to which they can be put. Many of the techniques described have biological applications but among others are methods for removal of peroxides from hydrocarbons and ethers, purification of hydrocarbon solvents for ultra-violet spectroscopy, dehydration of organic solvents and separation of iron from manganese chloride.

Head Wrightson Contract

Head Wrightson Stockton Forge, a subsidiary of Head Wrightson and Co., have received an order from Titania A/S of Norway for a special type class H 18 rotary dryer 104 inches by 70 feet long. Worth some £20,000, the machine is to be used to dry ilmenite in a titanium ore concentrates plant to be built at Telnes in South-West Norway.

New Pfizer Division

A separate division of Pfizer Ltd., Folkestone, Kent, has been set up to market products manufactured and distributed in this country for C. H. Boehringer Sohn, Ingelheim-am-Rhein, Germany. General manager of the new Boehringer Products Division will be Mr. W. R. Miller, who joined Pfizer in July 1952. The products marketed by the Boehringer division are Preludin, Buscopan, Dulcolax, Finalgon and Vasculit.

New Telephone Numbers

From 1 December the telephone numbers of the Northern sales division of Shell Chemical Co. Ltd. will be changed to Deansgate 2411-2420. The address, 144-6 Deansgate, Manchester 3, is unchanged.

Common Names for Pesticides

Draft addendum to BS 1831 suggests common names for some pesticides as under:

Proposed common name	*Chemical name*
benquinox	4-benzoquinone N'-benzoyl-hydrazone oxime
diphacinone	2-diphenylacetyl-1:3-indandione
phosphamidon	2-chloro-2-diethylcarbamoyl-1-methylvinyl dimethyl phosphate
phosphopyrone	*OO*-dimethyl 2-thiolophosphorylmethyl-5-methoxy-4-pyrone
trichlorphon	dimethyl (2:2:2-trichloro-1-hydroxyethyl) phosphonate

Comments on these draft names will be welcomed by the committee secretary, Mr. R. K. Thomas, at BSI, 2 Park Street, London W1.

Cold 'Bonderite' System

Now available in UK is the cold 'Bonderite' system which is designed primarily for treating steel by spray application. The treatment converts the metallic surface into a non-metallic, zinc phosphate coating which inhibits corrosion and increases durability of paint finishes. Further information is available from Metal Finishing Division, Pyrene Co. Ltd., Brentford, Middlesex.

Change of Address

On November 3, Ancorite Ltd., chemical engineering contractors and consultants, moved to larger premises at 2-4 Ladbrook Road, South Norwood, London SE25 (Livingstone 6616).

DIARY DATES

WEDNESDAY, 19 NOVEMBER

SAC, Scottish Section—Glasgow: Royal Philosophical Society, 207, Bath Street, 7-15 p.m. 'Developments in gas chromatography'—discussion.

Oil and Colour Chemists Assoc.—Newcastle: King's College, Stephenson Buildings, 7 p.m. 'Flow measurement with particular reference to the Dall tube' by D. H. Kent.

Manchester Metallurgical Society—Manchester: Manchester Room, Central Library, 6-30 p.m. 'Vacuum melting' by H. C. Child.

Incorporated Plant Engineers, Kent Branch—Dartford: Railway Hotel, 7 p.m 'Cathodic protection' by L. B. Hogben.

THURSDAY 20 NOVEMBER

SCI, Bristol Section—Bristol: The Manor, Bath Road, Bridgwater, 6-30 p.m. 'Plastics in packaging' by F. A. Paine.

SCI, Liverpool Section with **Surface Activity Group** and **RIC**—Preston: Council Chamber, Town Hall, 7-30 p.m. 'Water-repellent surfaces' by Prof. N. K. Adam.

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It is possible for suitably qualified students to enter the second year of the course, which is also starting on February 16th, 1959.

Full details regarding the scope of the course, conditions of entry, etc., may be obtained from the Head of the Department of Applied Chemistry.

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